Figure 1

```
┌─────────────┐
│    Start    │
└─────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Receive Signal Containing Gaussian       │
│  Pulse and Noise                          │
│  202                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Determine Coarse Estimation of Gaussian  │
│  Pulse Parameters Alpha_p, t_p, and w_p   │
│  Using Zoom-In Approach                   │
│  204                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Generate Permutations of Coarse          │
│  Estimation Gaussian Pulse Parameters     │
│  206                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Calculate Inner Product, Q, Between      │
│  Received Signal and Each Permutation     │
│  of Coarse Estimation Gaussian Pulse      │
│  Parameters                               │
│  208                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Generate Multiple Linear Equations       │
│  From Calculated Inner Products           │
│  210                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌──────────────────────────────────────────┐
│  Overdetermine Gaussian Pulse Parameters  │
│  by Solving the Linear Equations          │
│  212                                      │
└──────────────────────────────────────────┘
       │
       ▼
┌─────────────┐
│     End     │
└─────────────┘
```

Receive Signal Containing Gaussian Pulse and Noise
202

Determine Coarse Estimation of Gaussian Pulse Parameters Alpha$_p$, t$_p$, and w$_p$ Using Zoom-In Approach
204

Generate Permutations of Coarse Estimation Gaussian Pulse Parameters
206

Calculate Inner Product, Q, Between Received Signal and Each Permutation of Coarse Estimation Gaussian Pulse Parameters
208

Generate Multiple Linear Equations From Calculated Inner Products
210

Overdetermine Gaussian Pulse Parameters by Solving the Linear Equations
212

Figure 2

```
┌─────────────────────────────────────────────────┐
│  Determine Coarse Estimation of Gaussian Pulse   │
│   Parameters Alphap, tp, and  wp Using Zoom-In   │
│                    Approach                      │
│                      204                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│   Determine Current Area Of Interest of the      │
│                Received Signal                   │
│                      302                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│         Select Current Gaussian Window           │
│                      304                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│            Perform Windowed FFT                  │
│                      306                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│       Identify Peak Frequency Amplitude          │
│                      308                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│   Select Gaussian Window With Maximum Peak       │
│               Frequency Amplitude                │
│                      310                         │
└─────────────────────────────────────────────────┘
                        │
                        ▼
┌─────────────────────────────────────────────────┐
│     Determine Parameters of Selected Gaussian    │
│          Window (with Maximum Peak)              │
│                      312                         │
└─────────────────────────────────────────────────┘
```

Figure 3

```
┌─────────────────────────────────────────────┐
│          Characterize Gaussian Pulse          │
│                      402                      │
└─────────────────────────────────────────────┘
                       │
                       ▼
┌─────────────────────────────────────────────┐
│        Subtract Gaussian Pulse From Signal    │
│                      404                      │
└─────────────────────────────────────────────┘
                       │
                       ▼
Yes              ╱────────────────╲              No
◄────────────────  More Pulses To Characterize?  ──────────┐
                 ╲         406       ╱                      │
                  ╲────────────────╱                        │
                                                            ▼
                              ┌──────────────────────────────────────┐
                              │   Determine Gaussian Pulses That       │
                              │ Correspond to Original and Reflected   │
                              │               Pulses                   │
                              │                408                     │
                              └──────────────────────────────────────┘
                                              │
                                              ▼
                              ┌──────────────────────────────────────┐
                              │  Determine Location of Fault in Medium │
                              │                410                     │
                              └──────────────────────────────────────┘
```

Figure 4

Initial Gaussian Pulse
502A

Reflected Gaussian Pulses
504A

Figure 5A

Original Signal
506

Initial Gaussian
Pulse
502B

Reflected Gaussian
Pulse
504B

Estimated
Signal
508

Residual
Signal
510

Figure 5B

Figure 5C

Original
Signal
506B

residual

reconstruction

raw data

Waveform
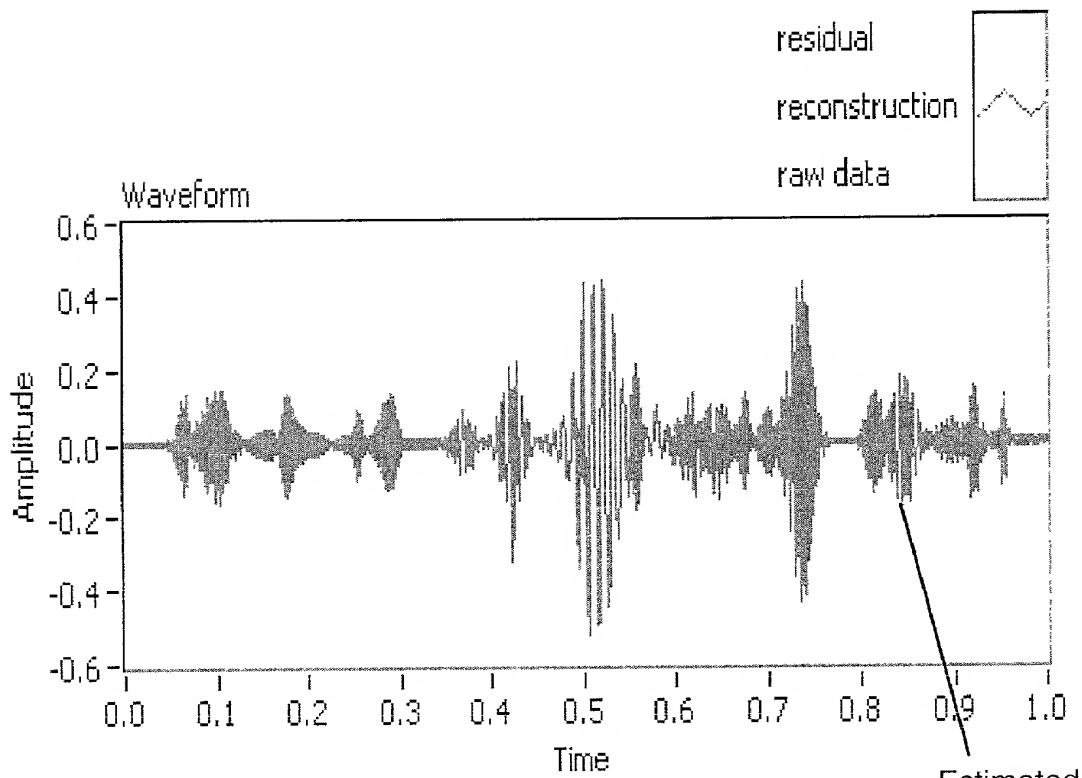
Figure 5D

Estimated
Signal
508B
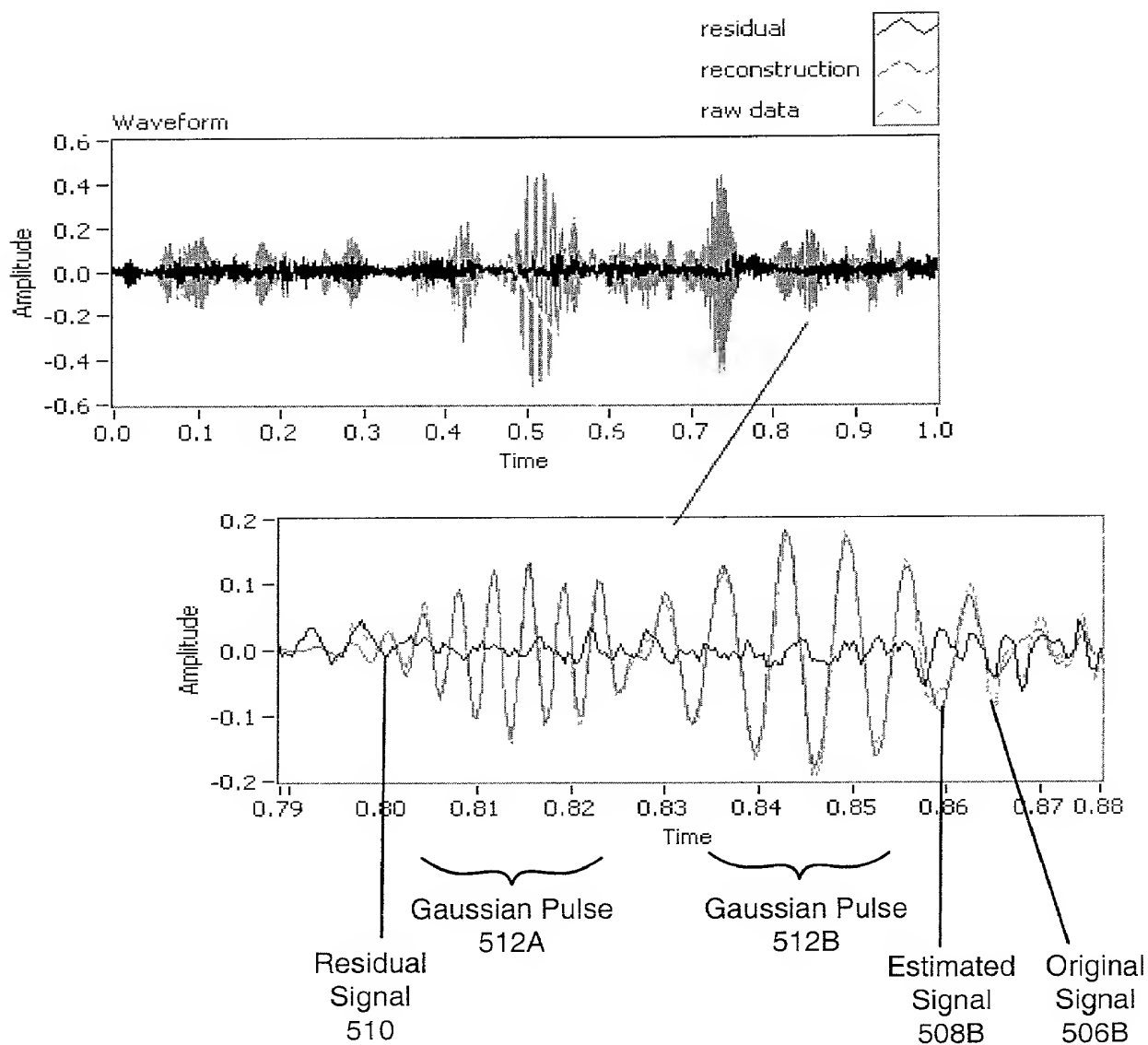
Figure 5E

Figure 6A
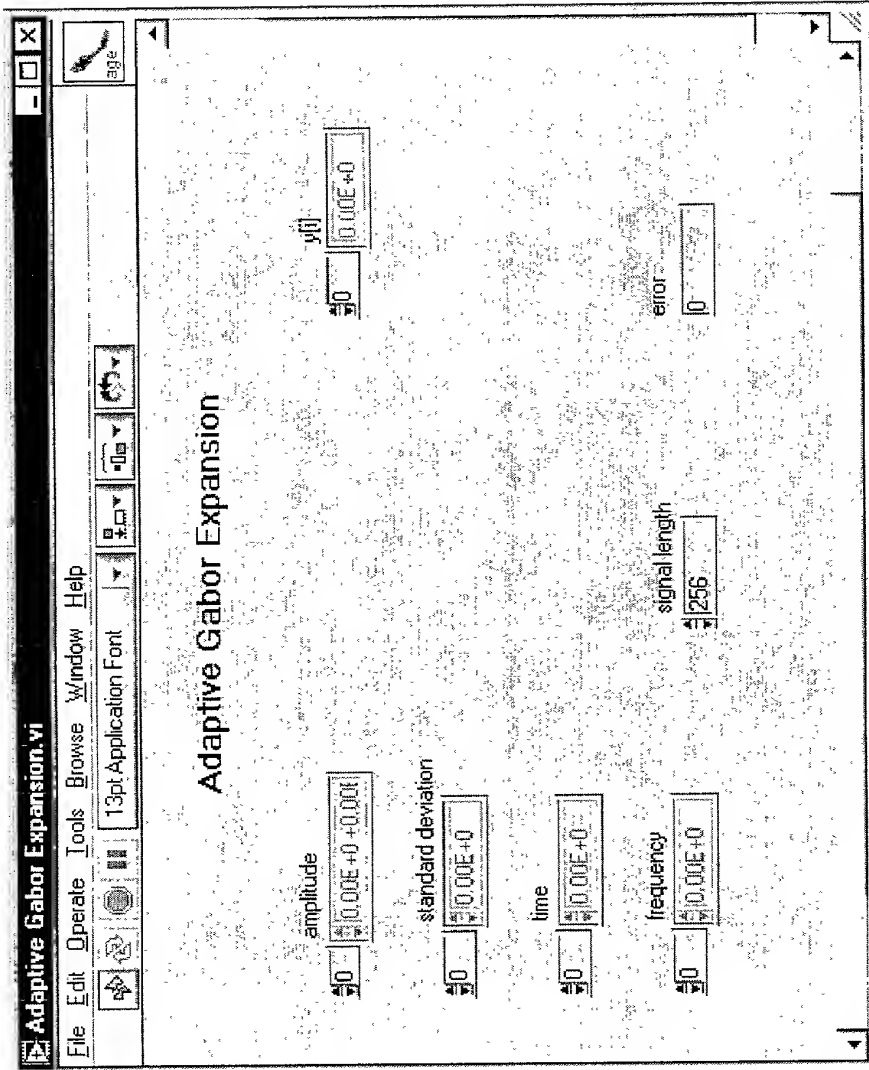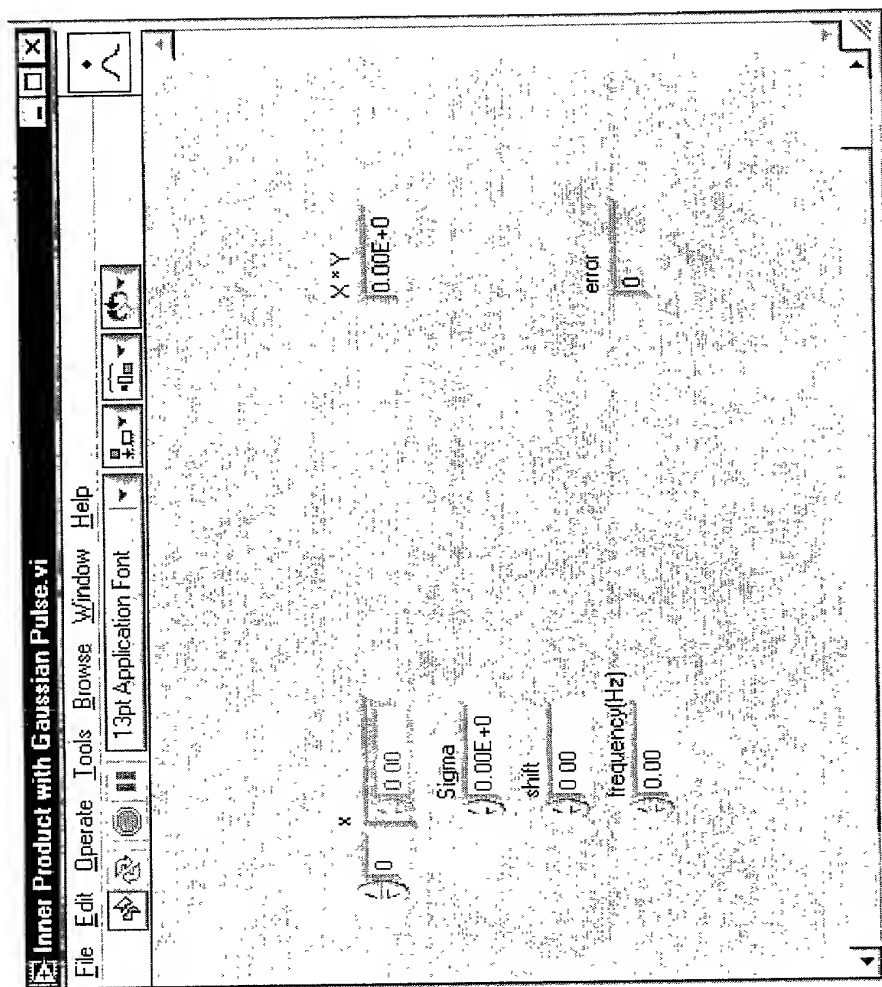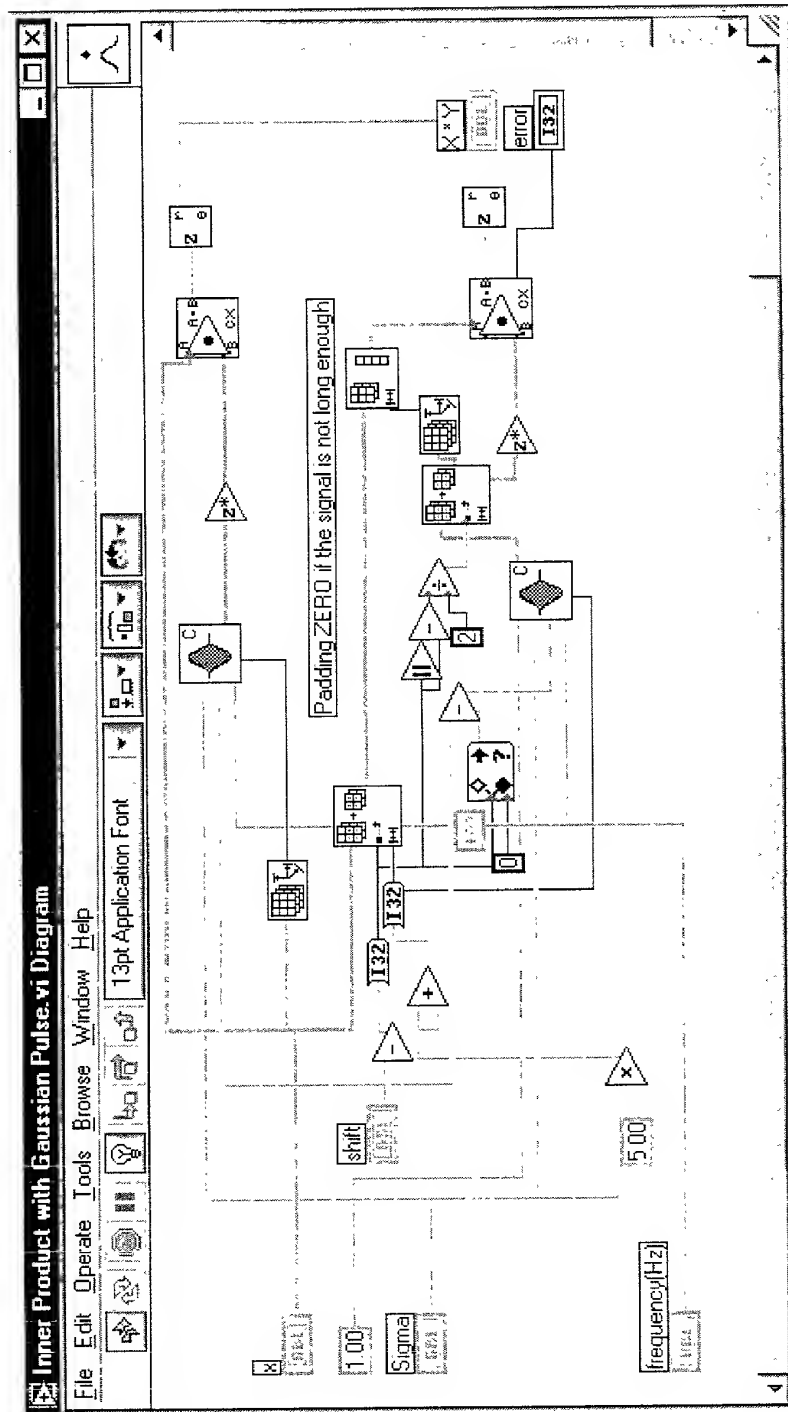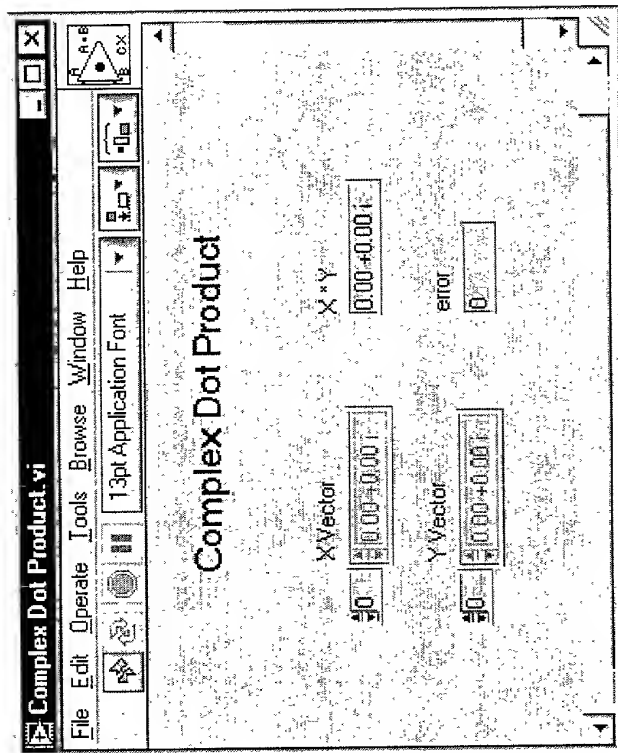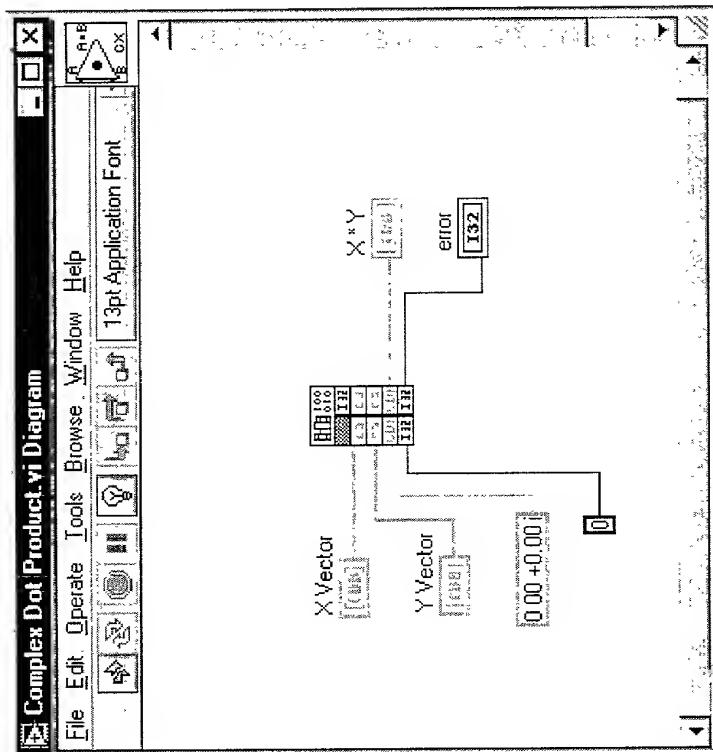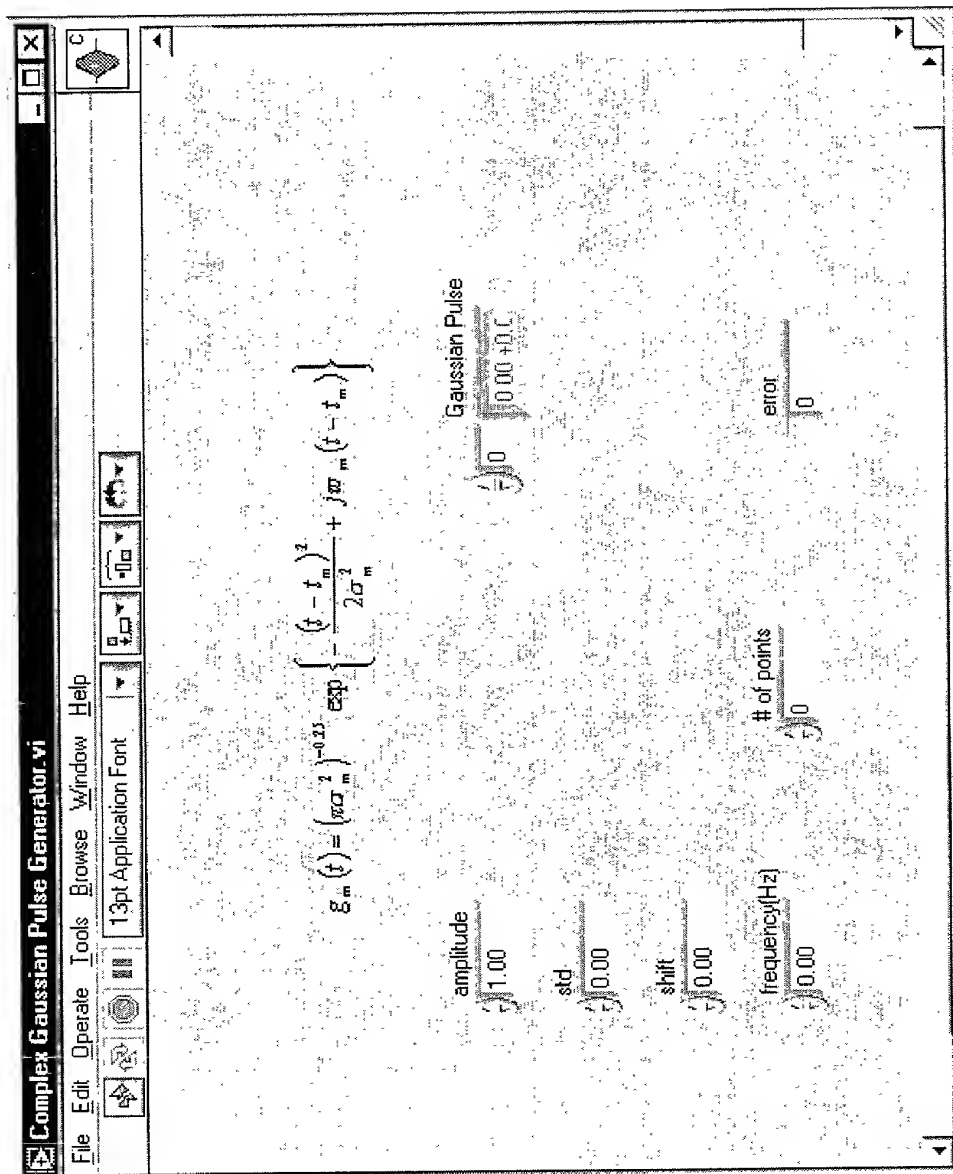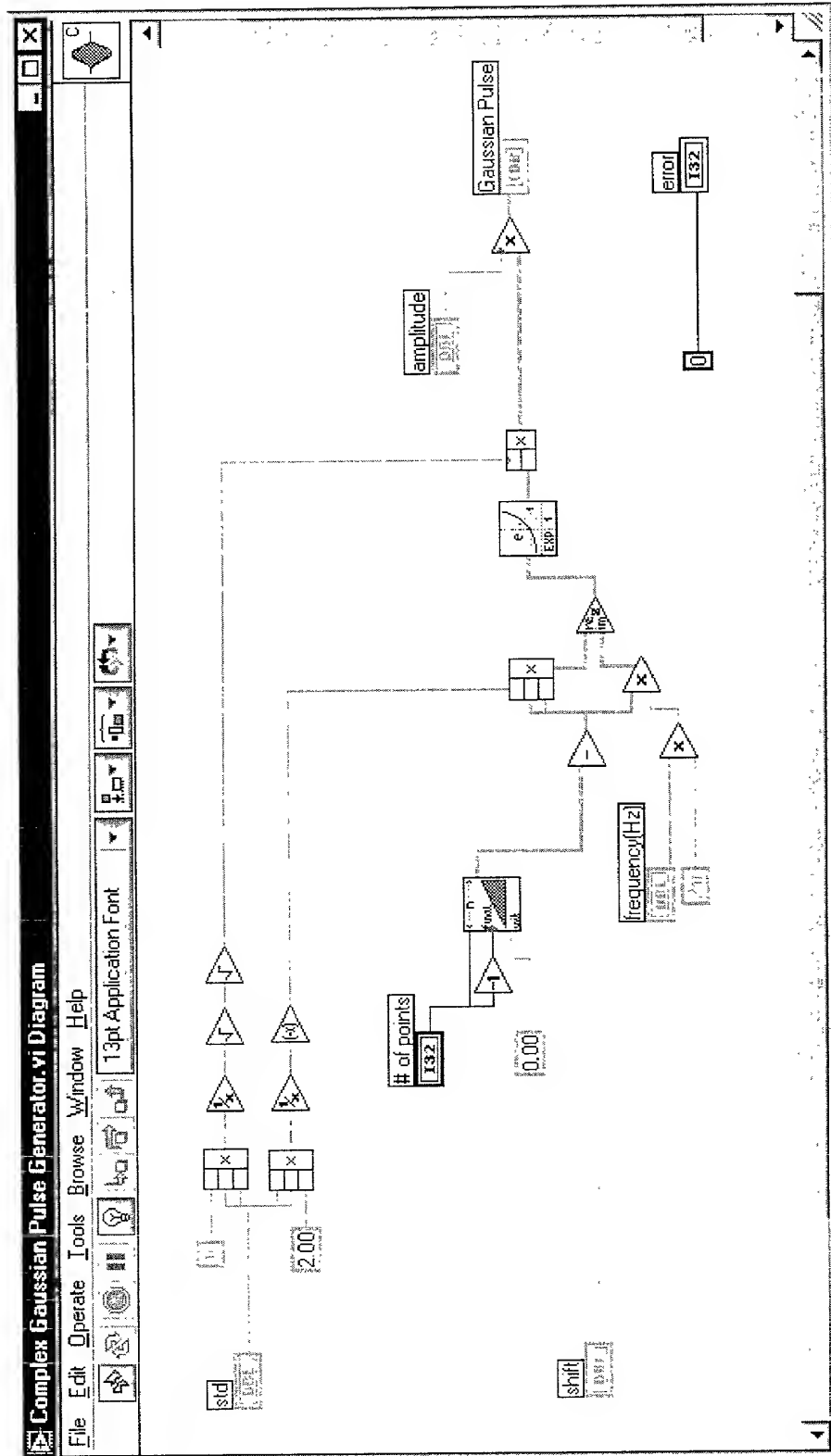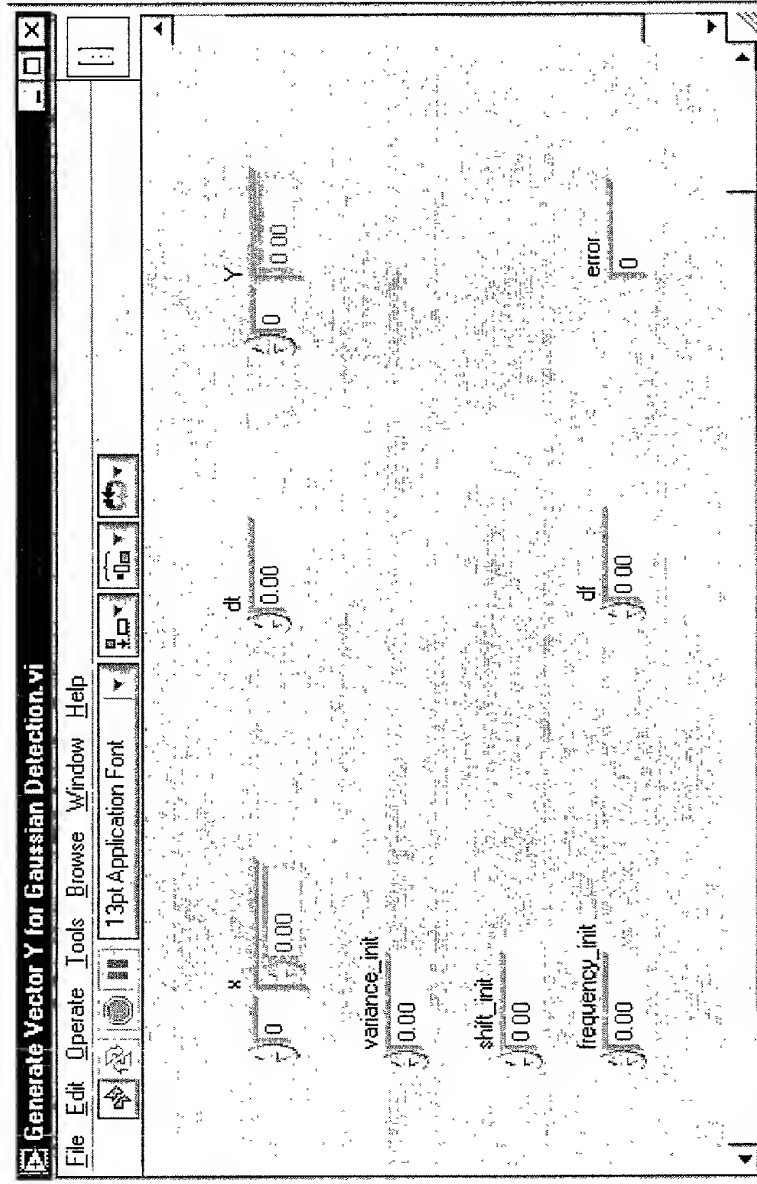
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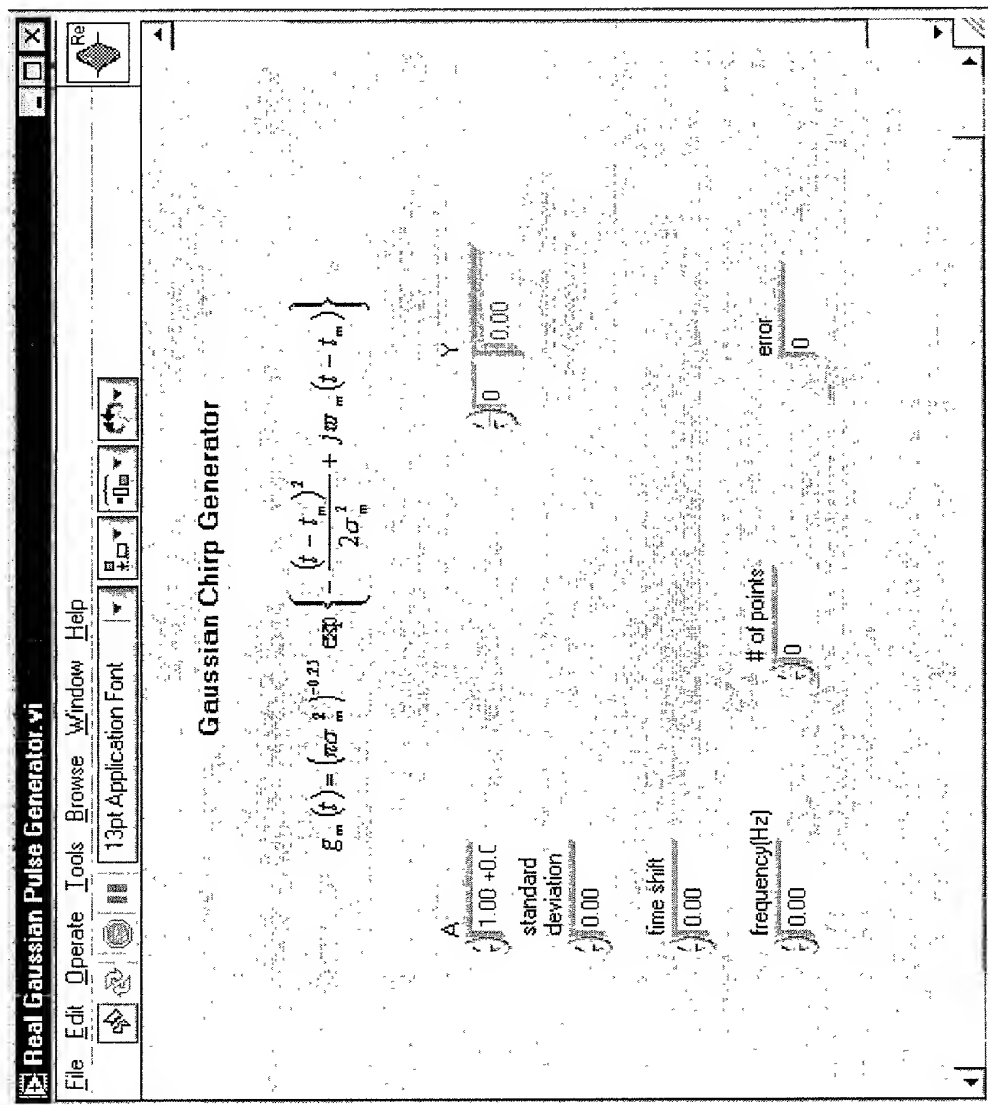
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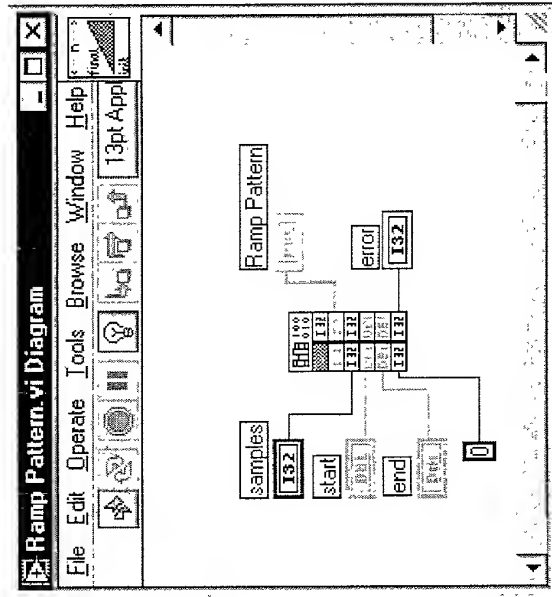
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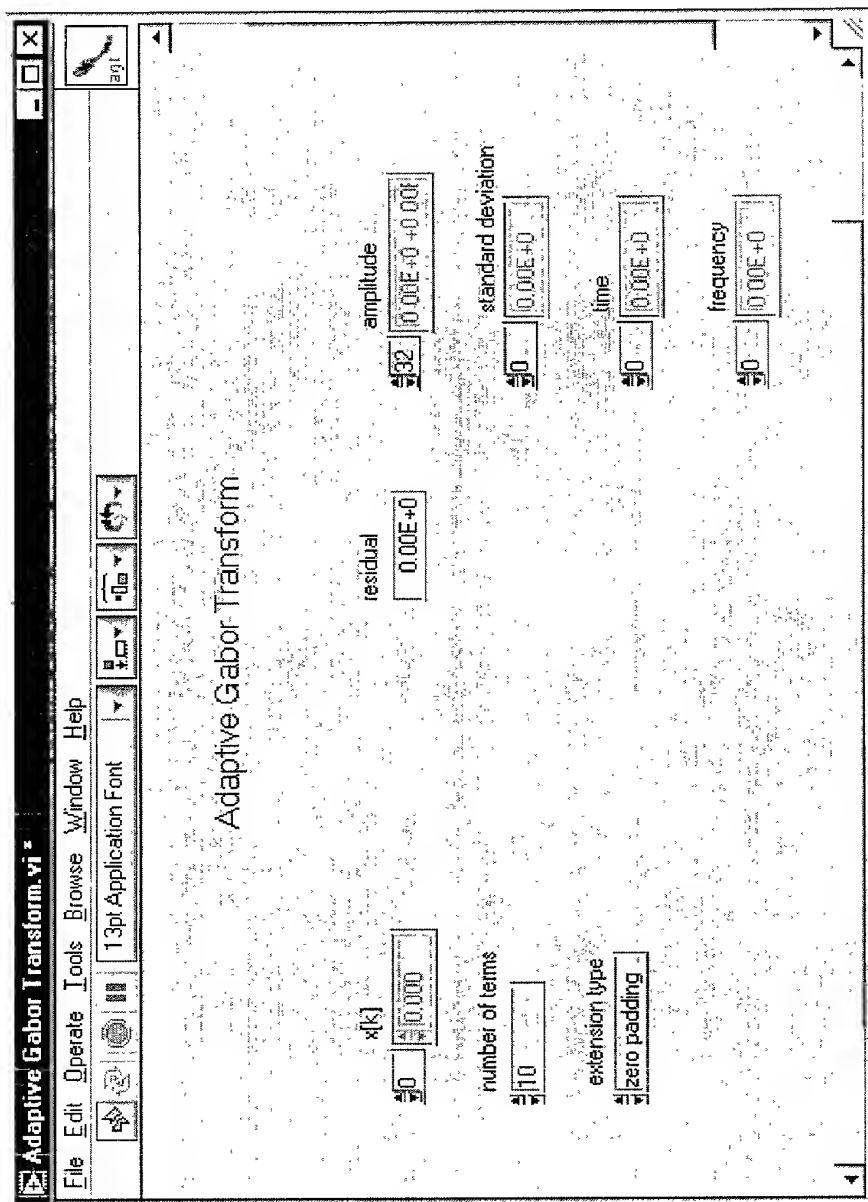
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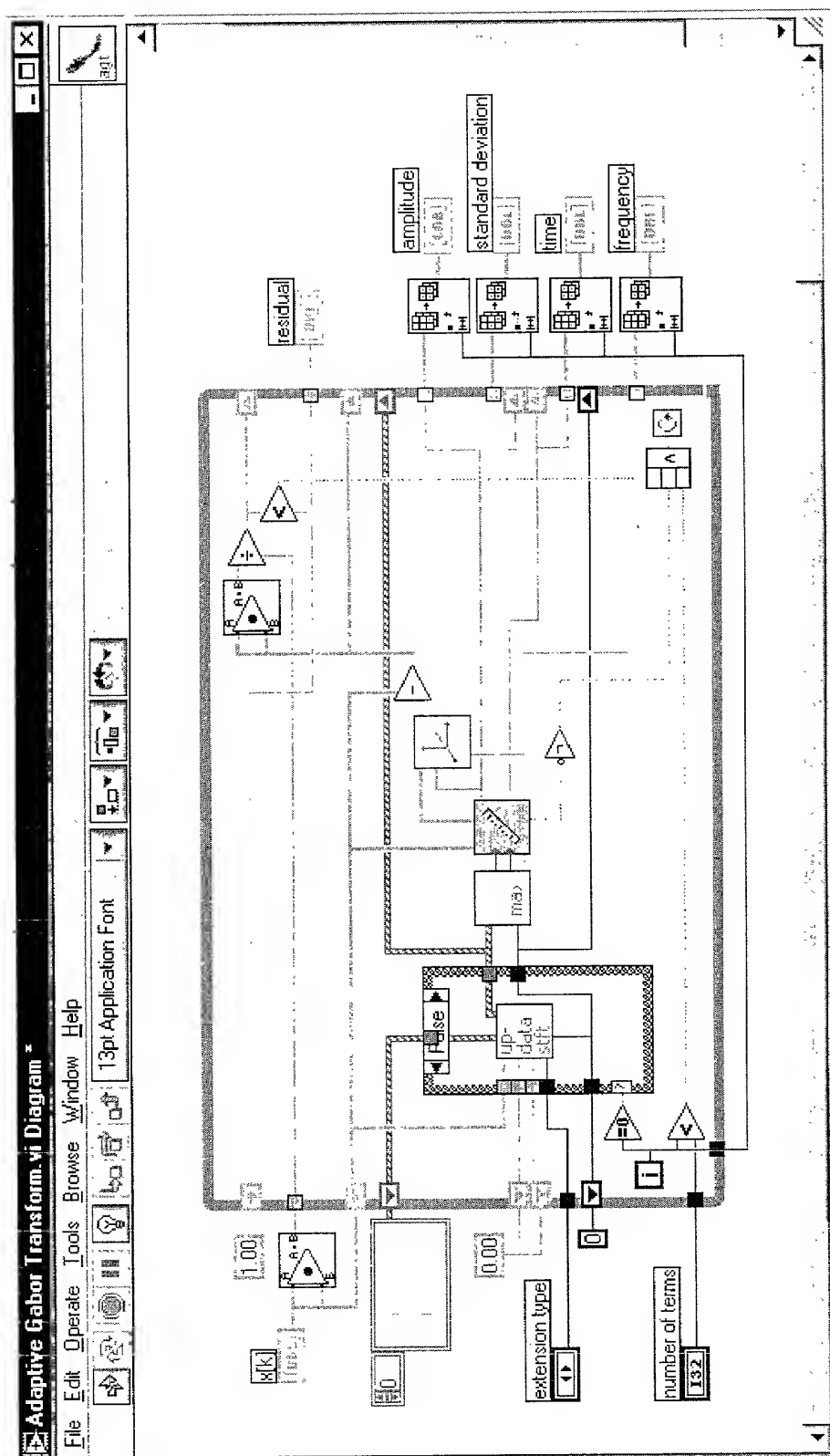
Figure 8B

Figure 9A

Figure 9B
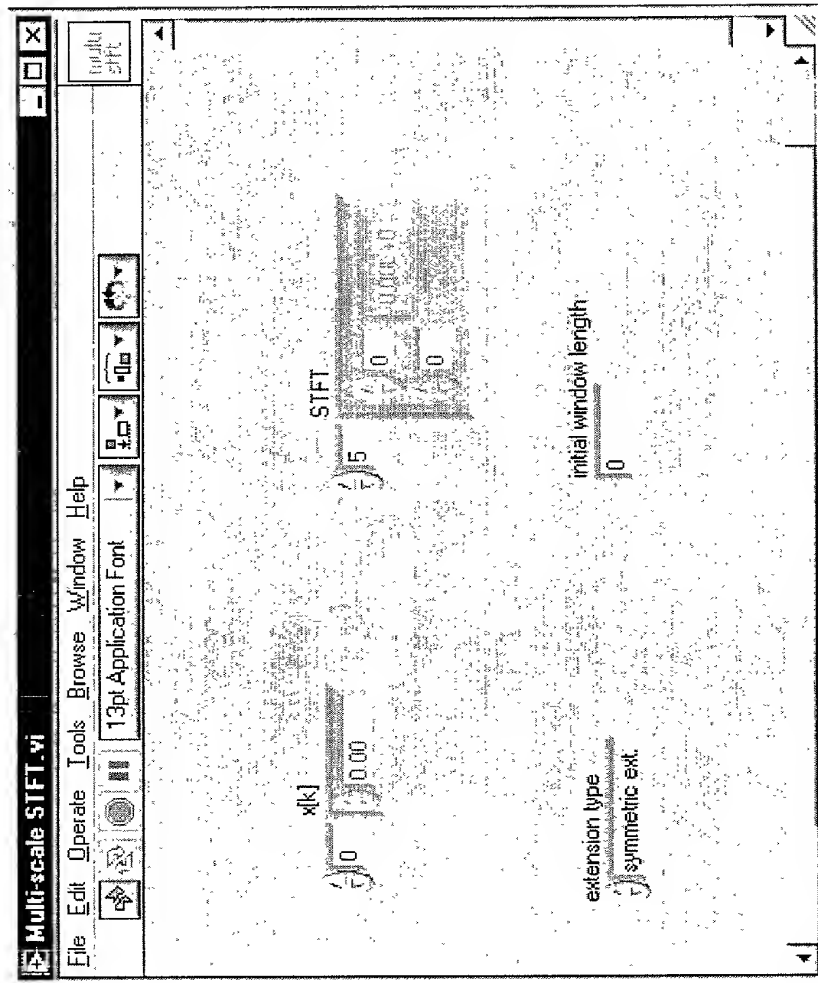
Figure 10A
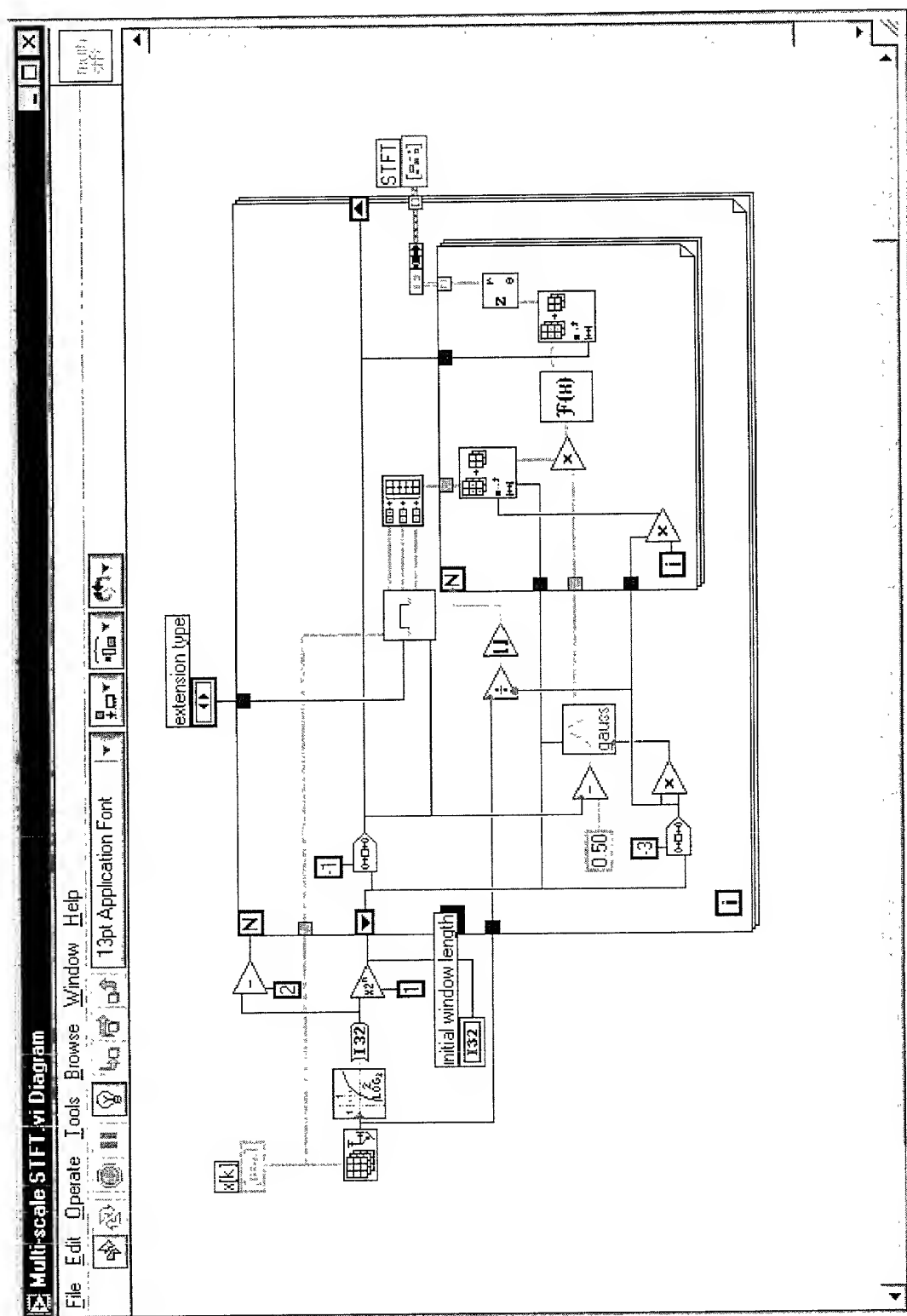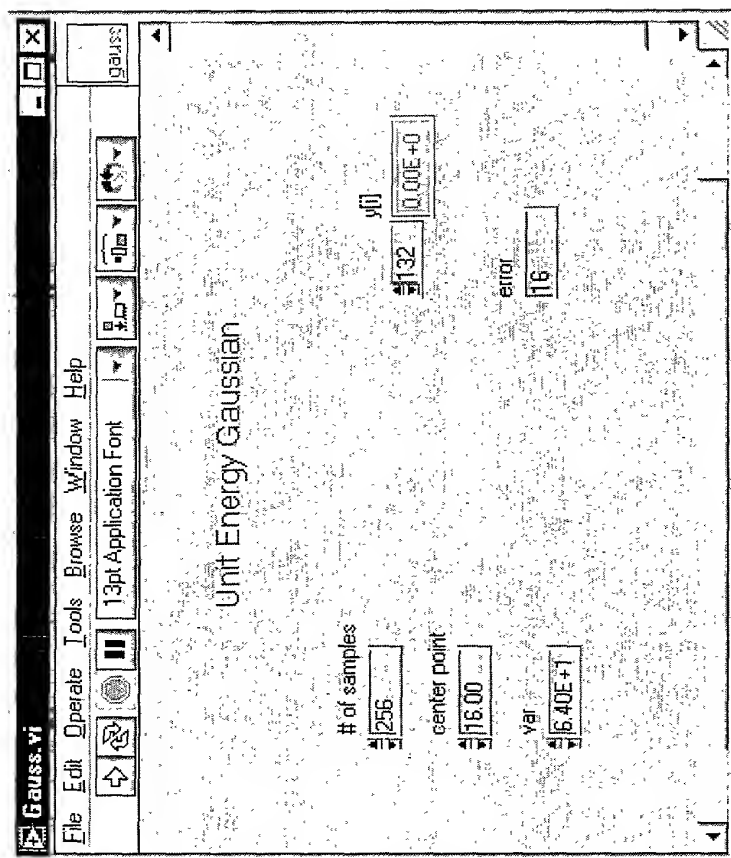
Figure 10B

Figure 11A
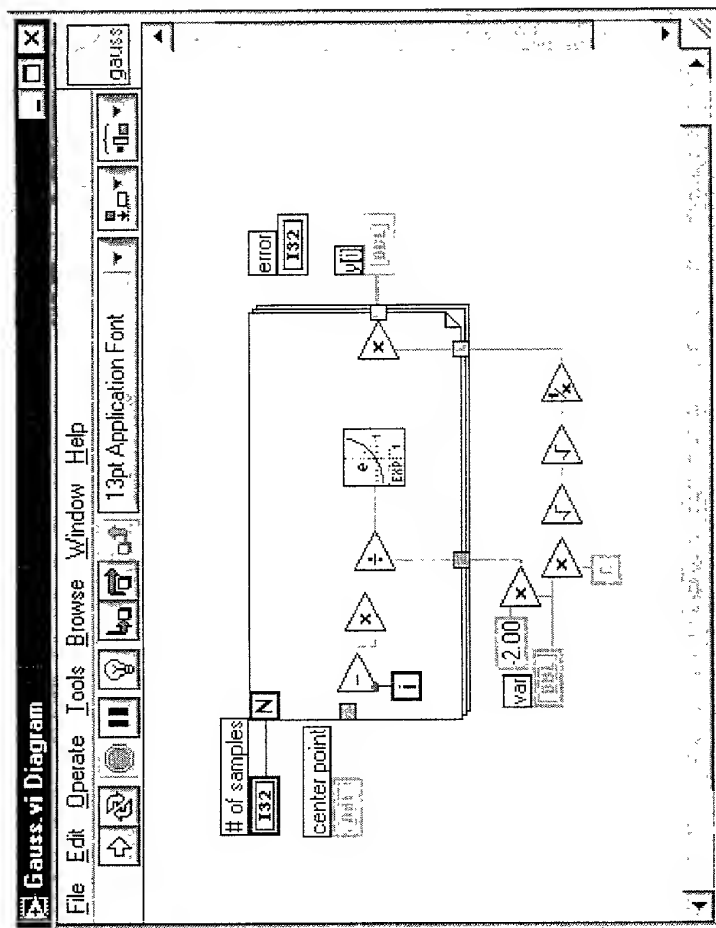
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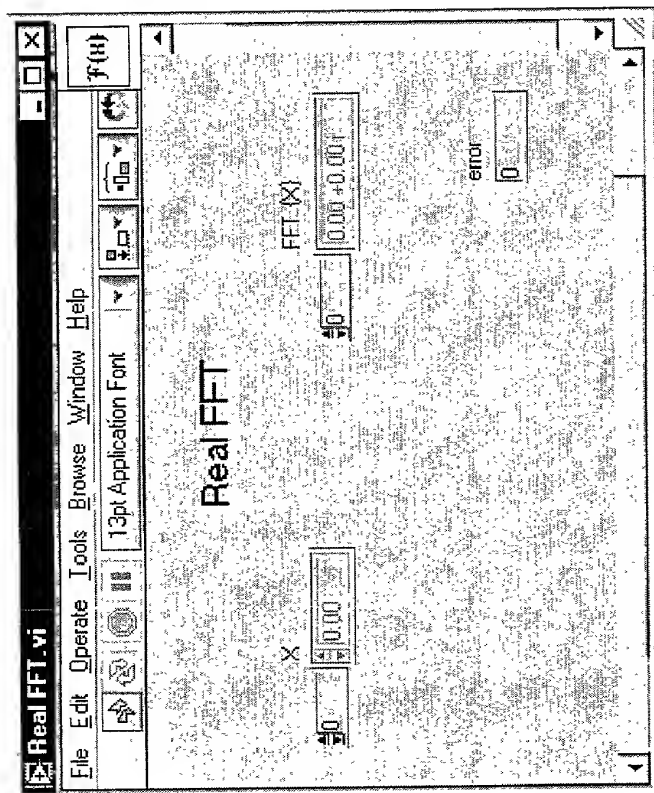
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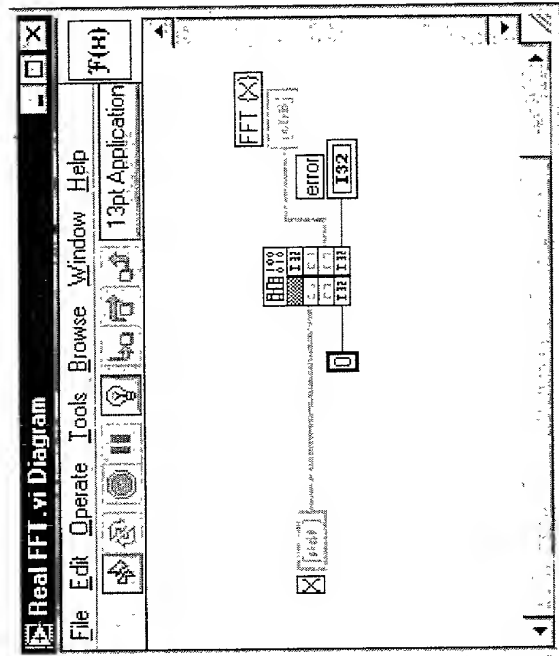
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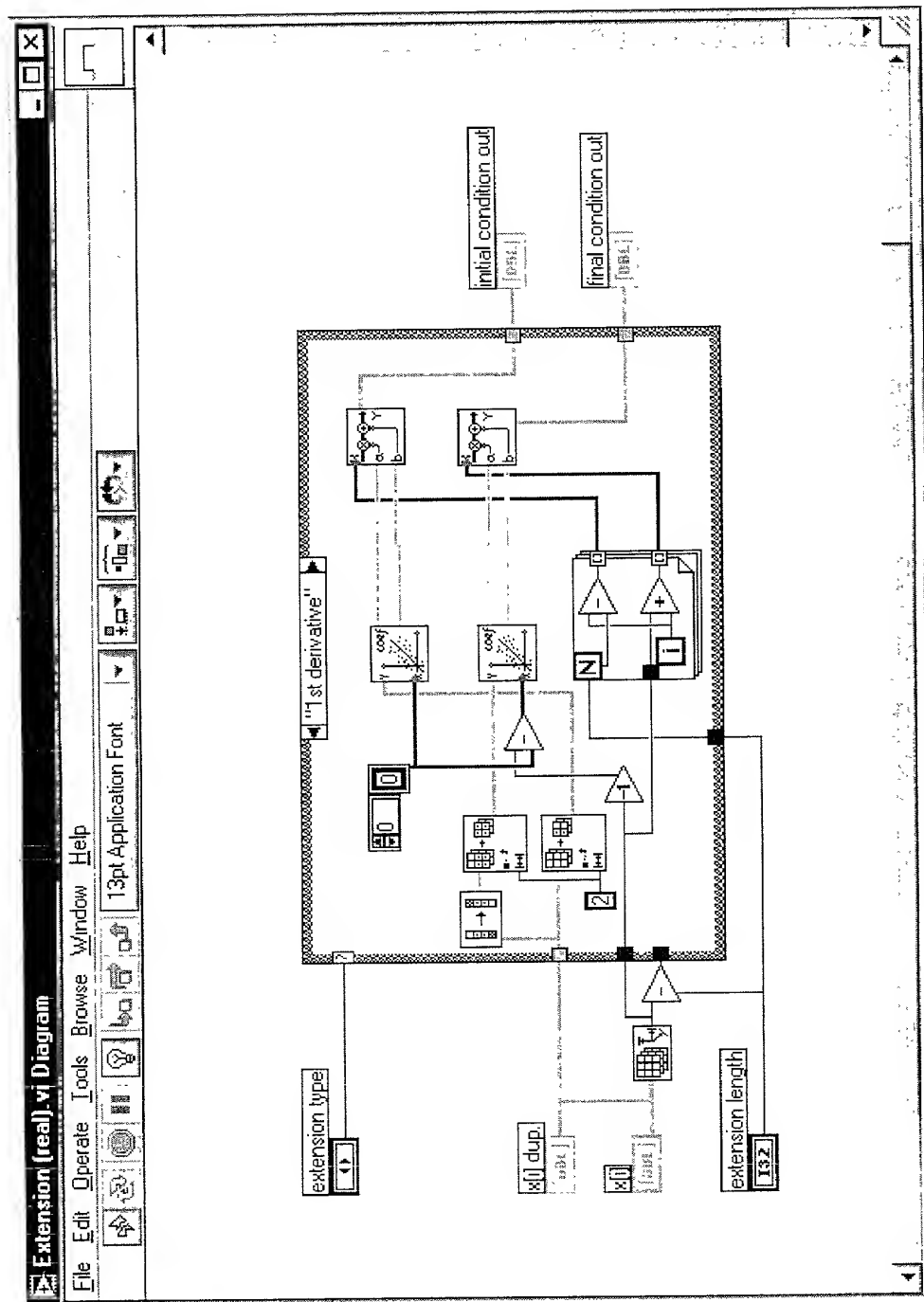
Figure 13A

Figure 13B
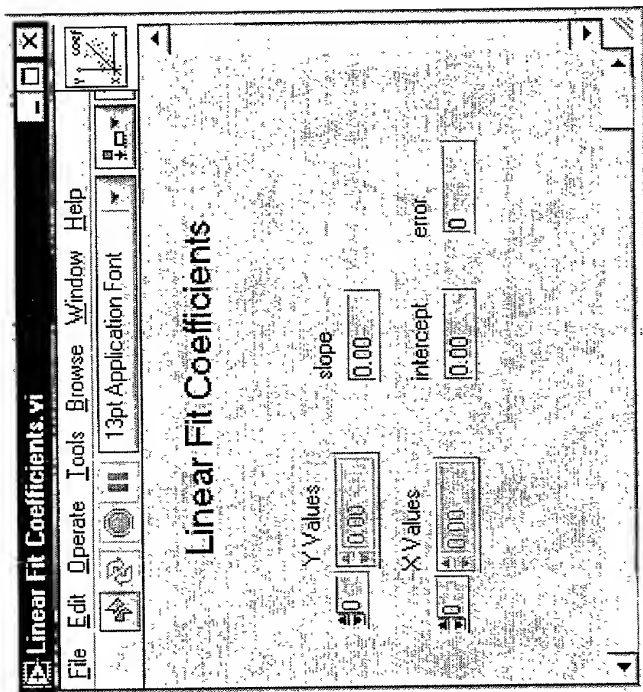
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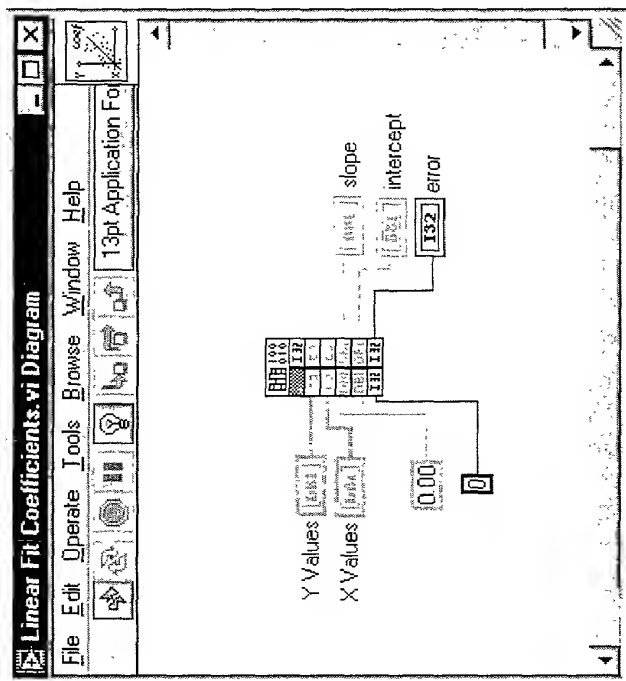
Figure 14A

Figure 14B
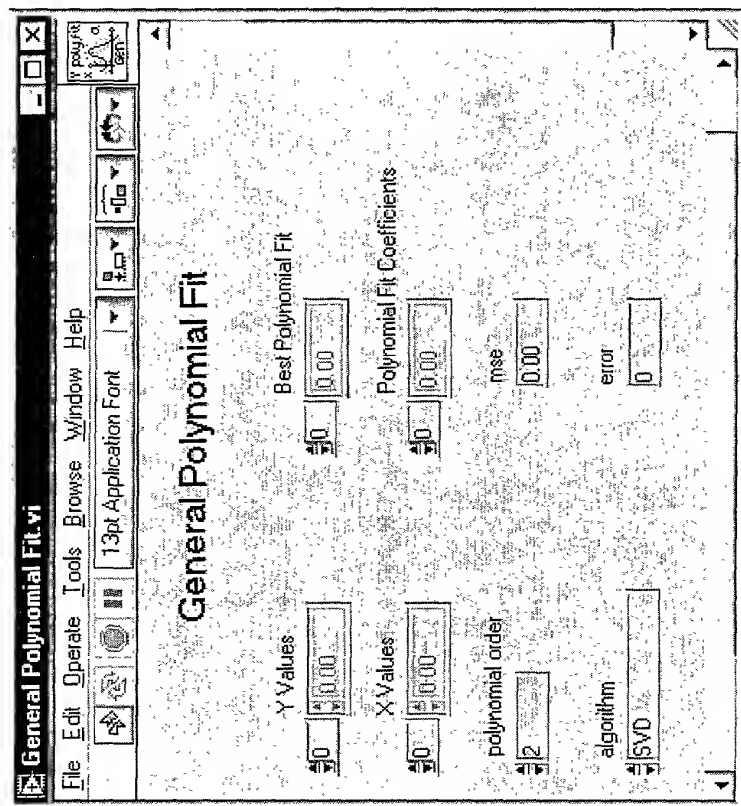
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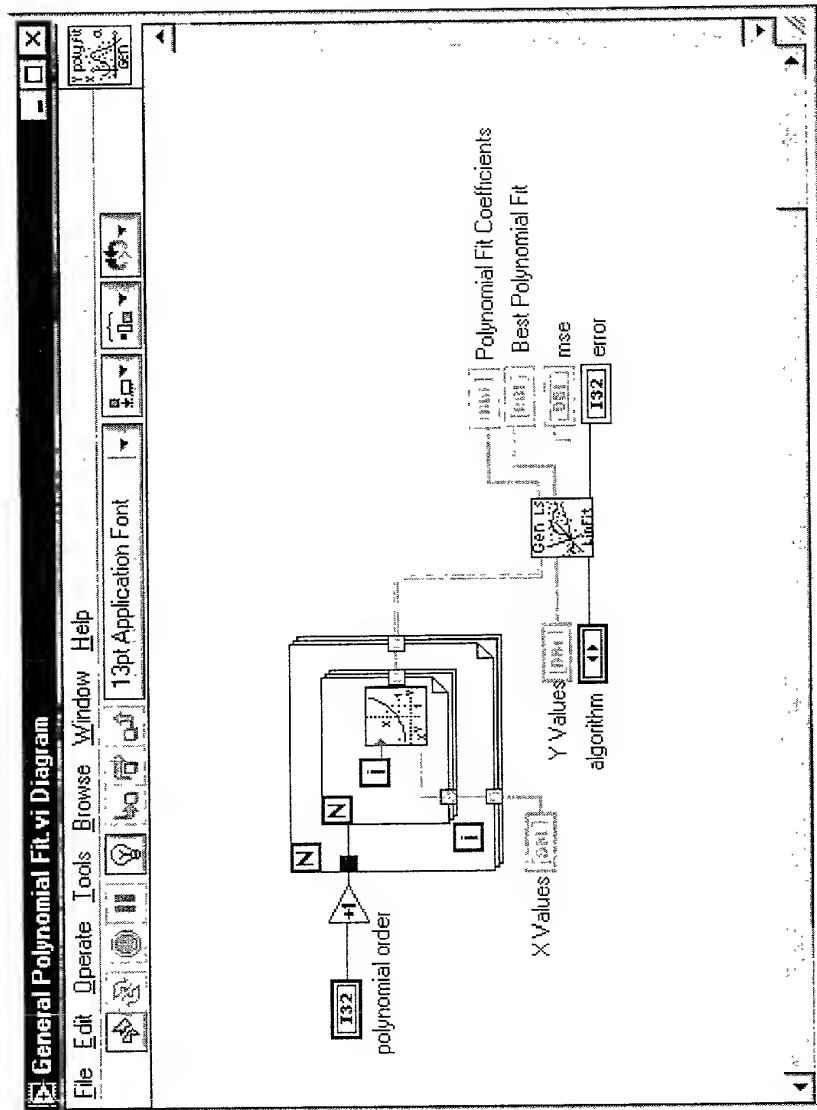
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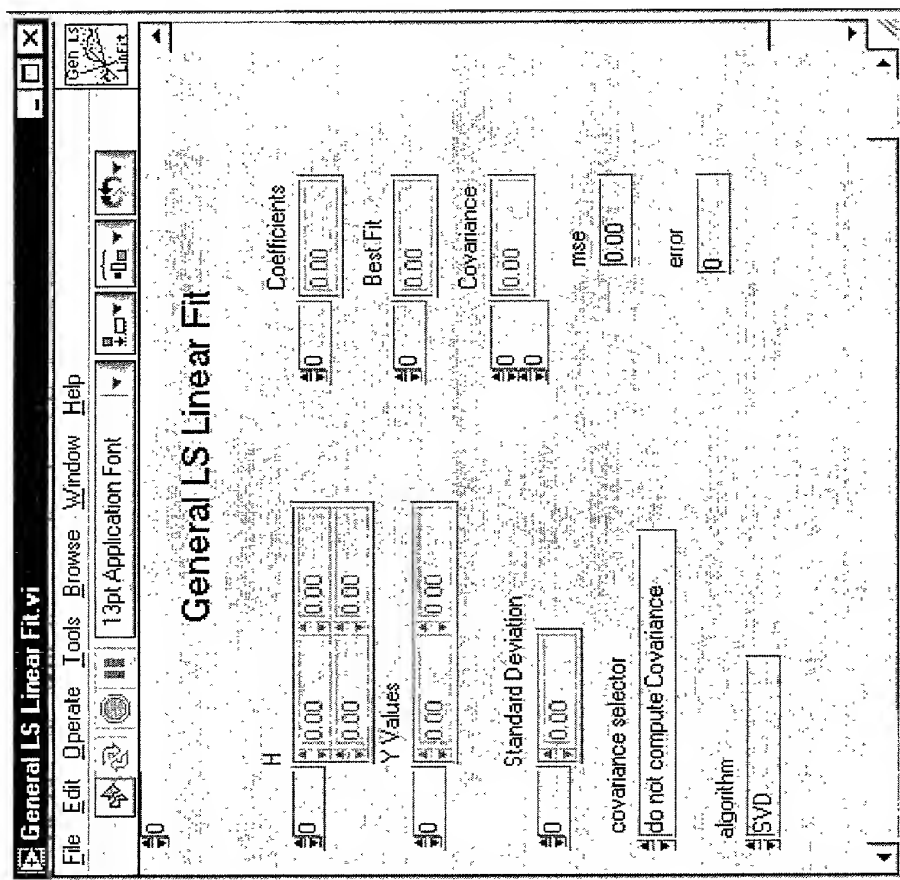
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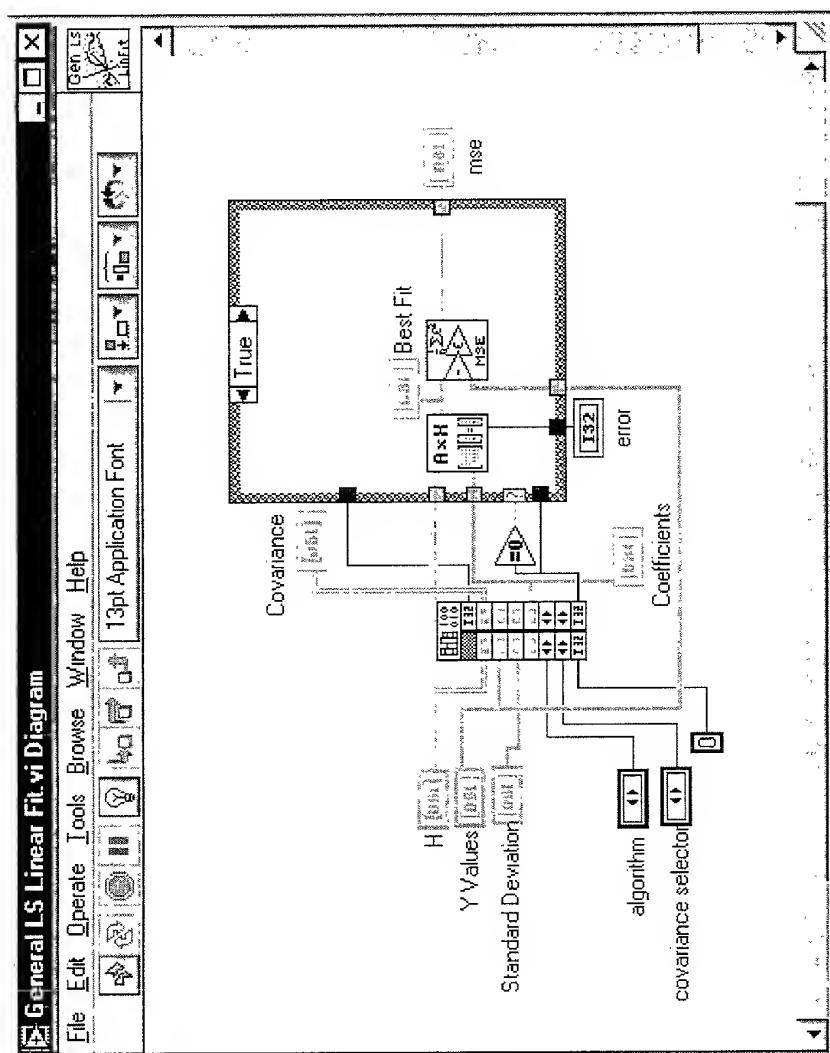
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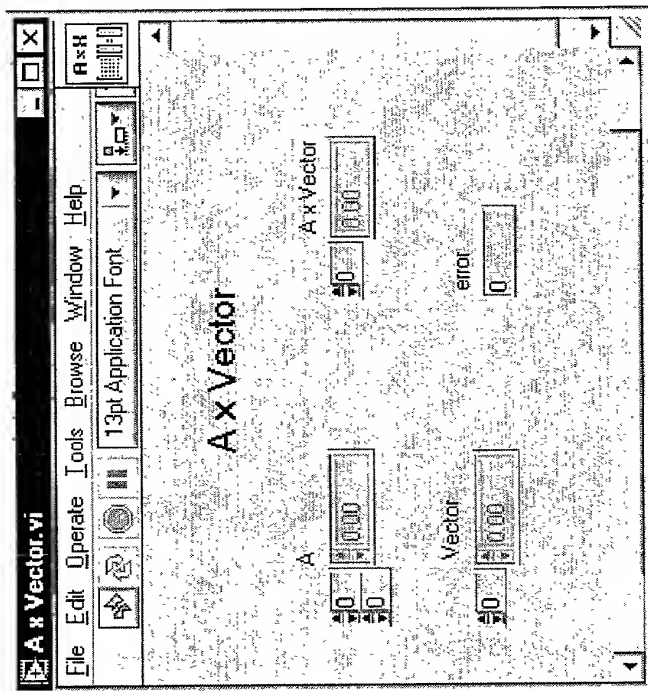
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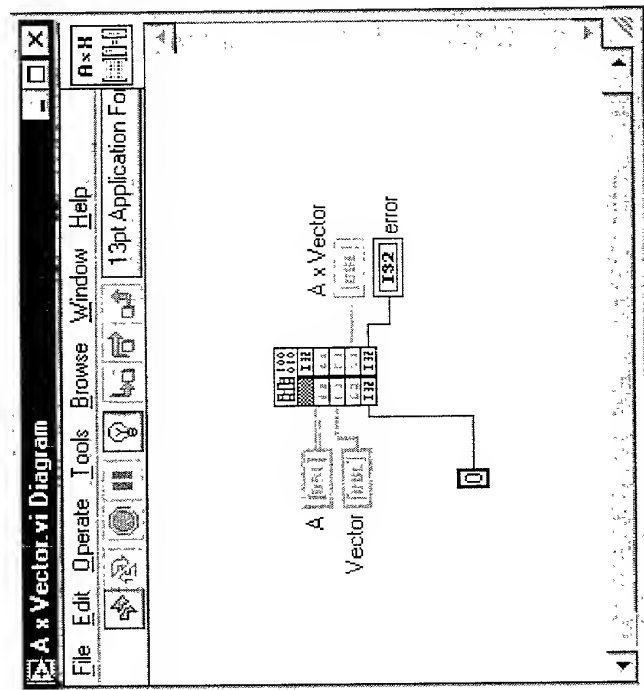
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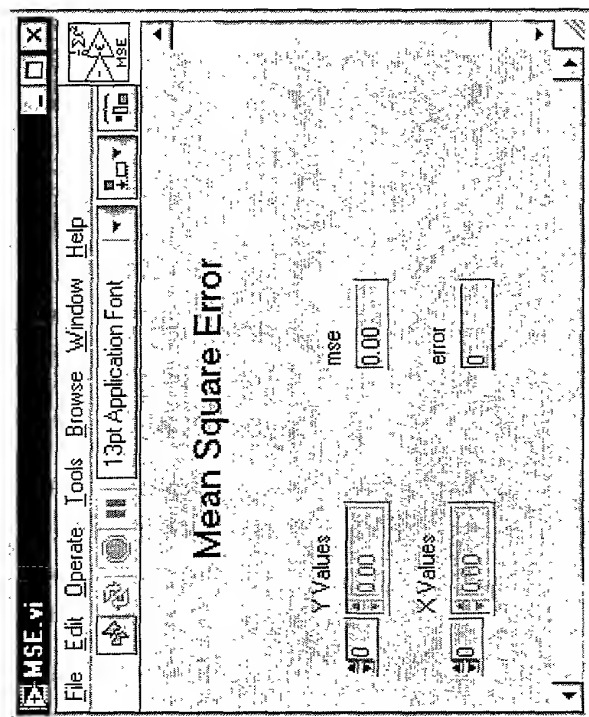
Figure 18A

Figure 18B
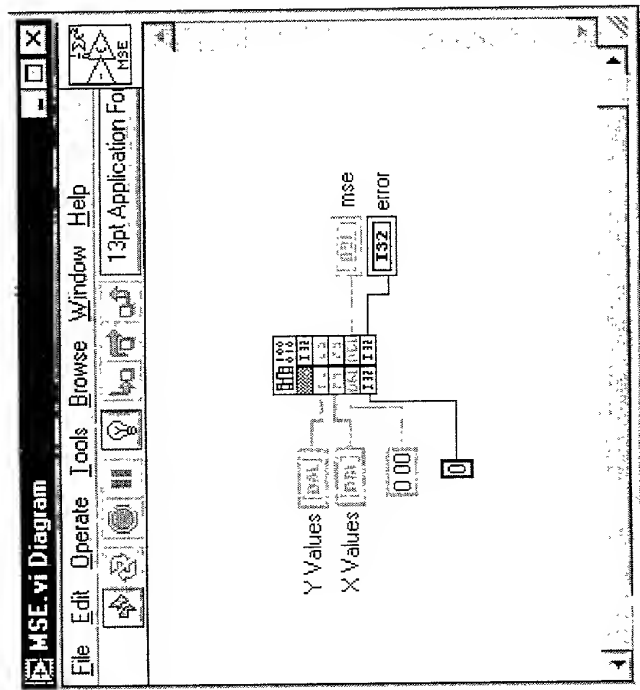
Figure 19A

Figure 19B
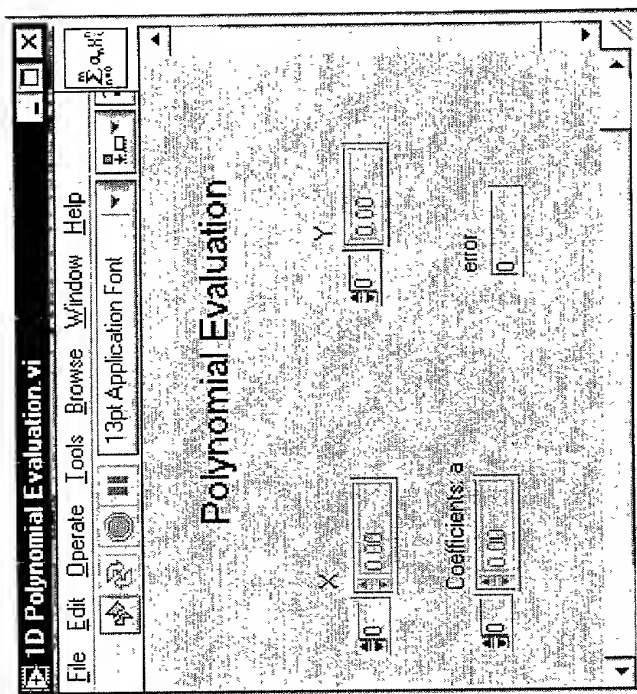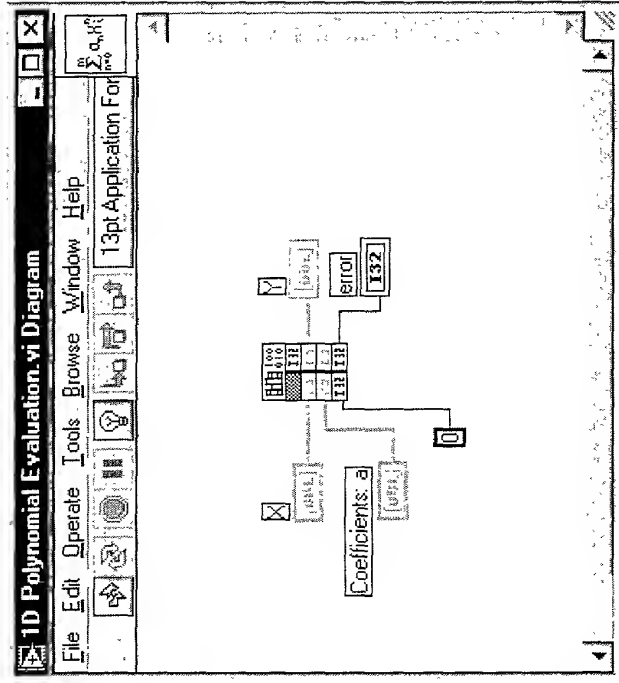
Figure 20A

Figure 20B
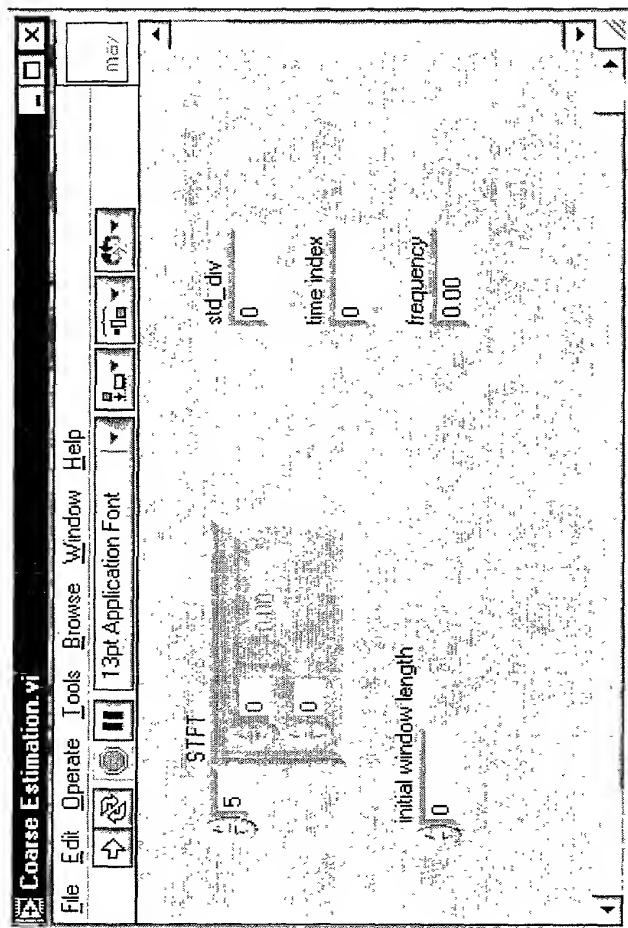
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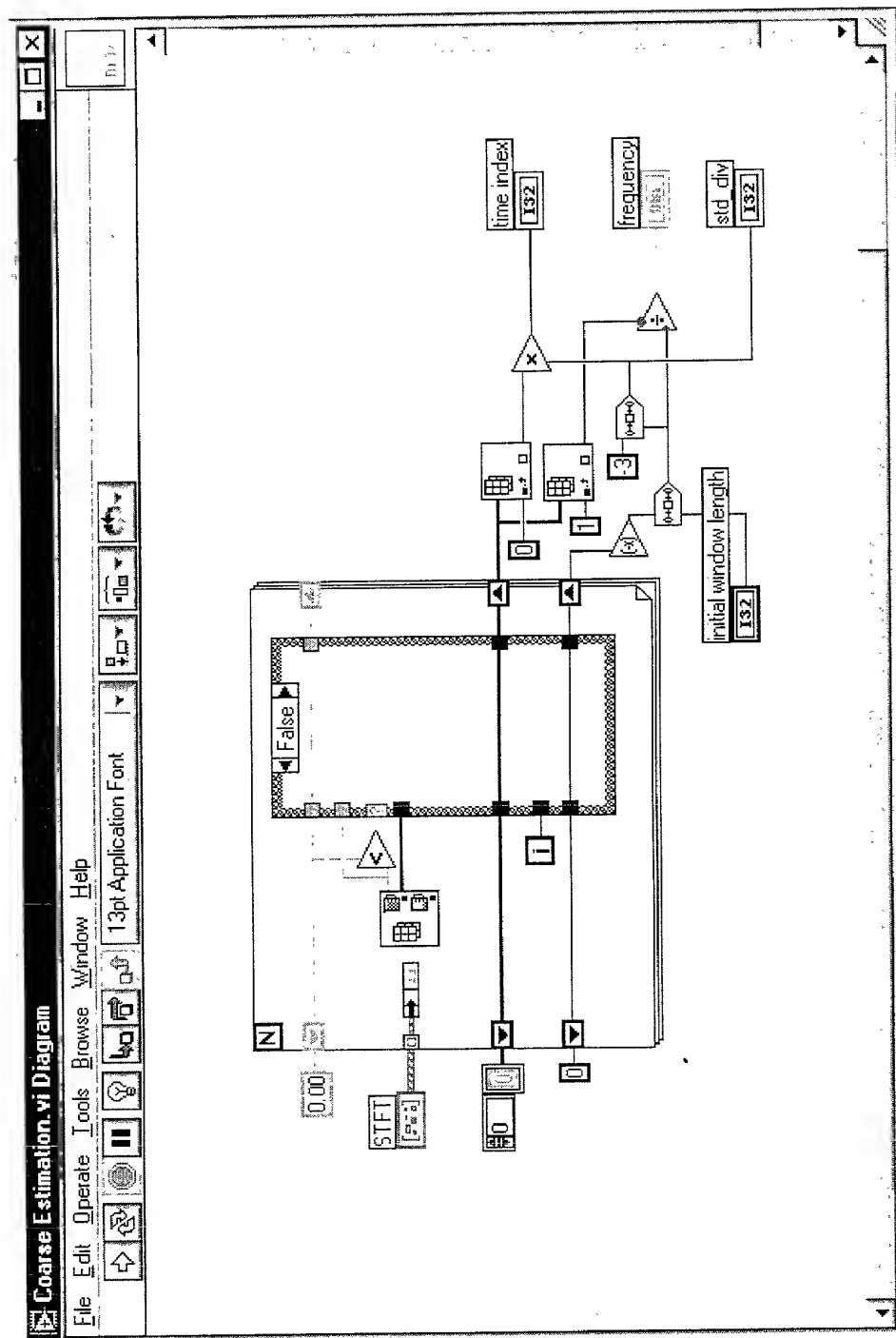
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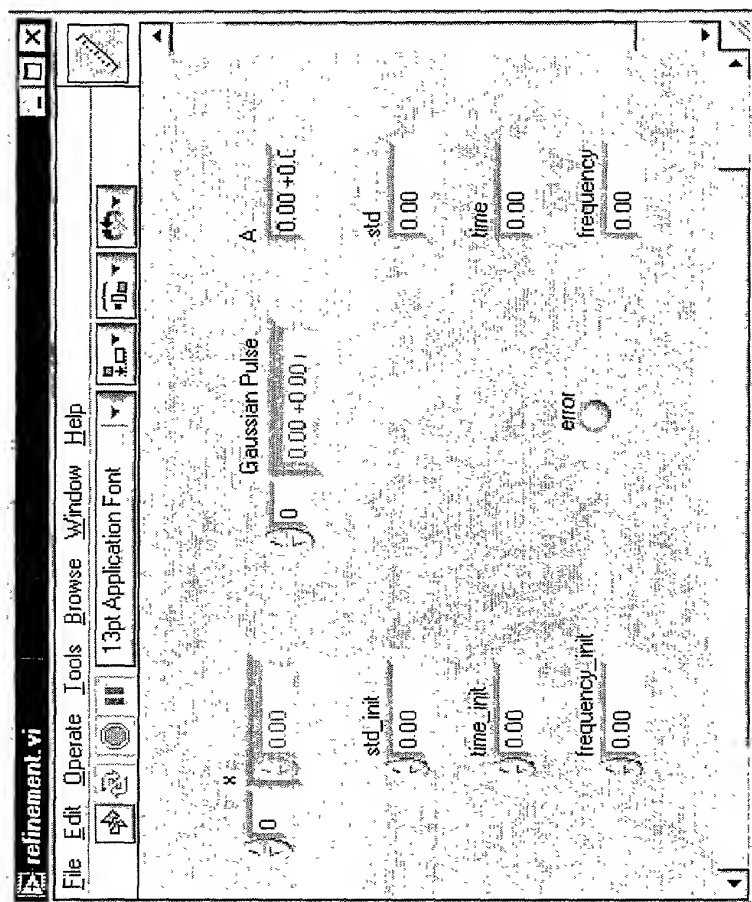
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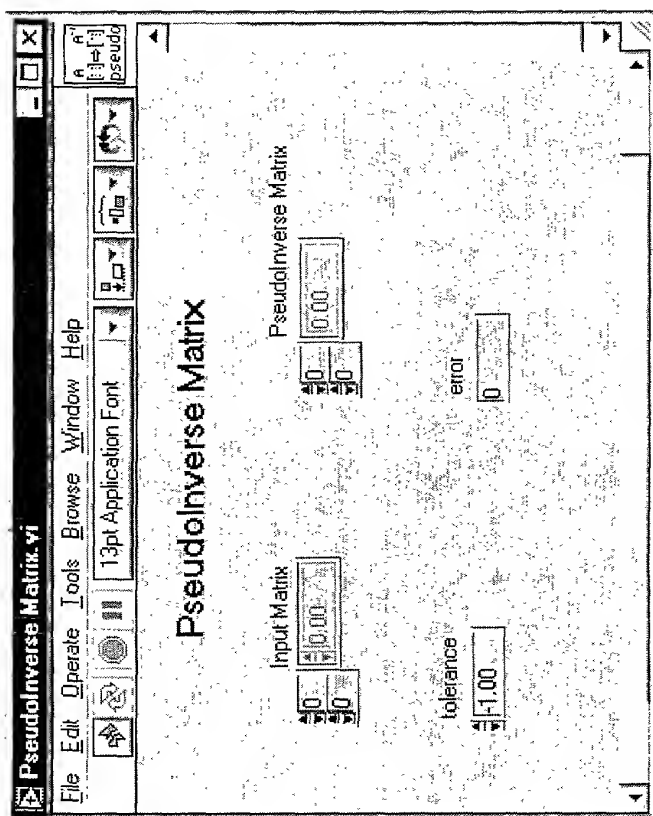
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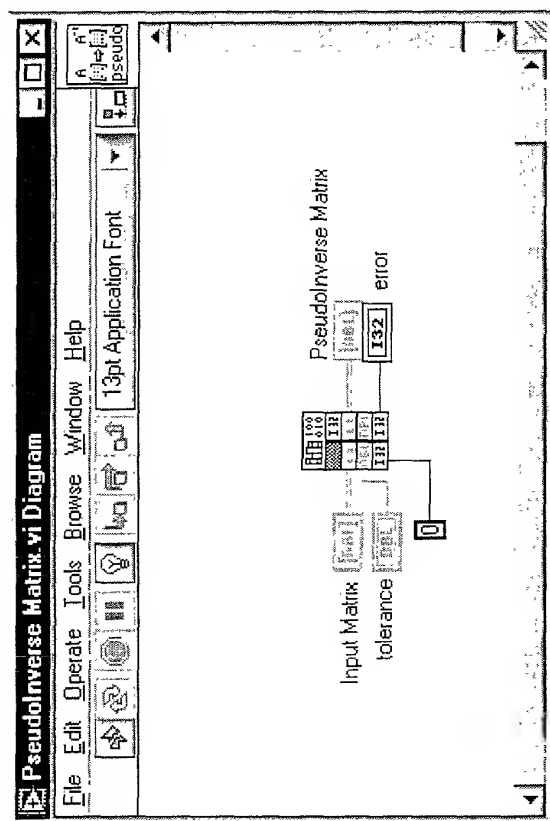
Figure 23A

Figure 23B
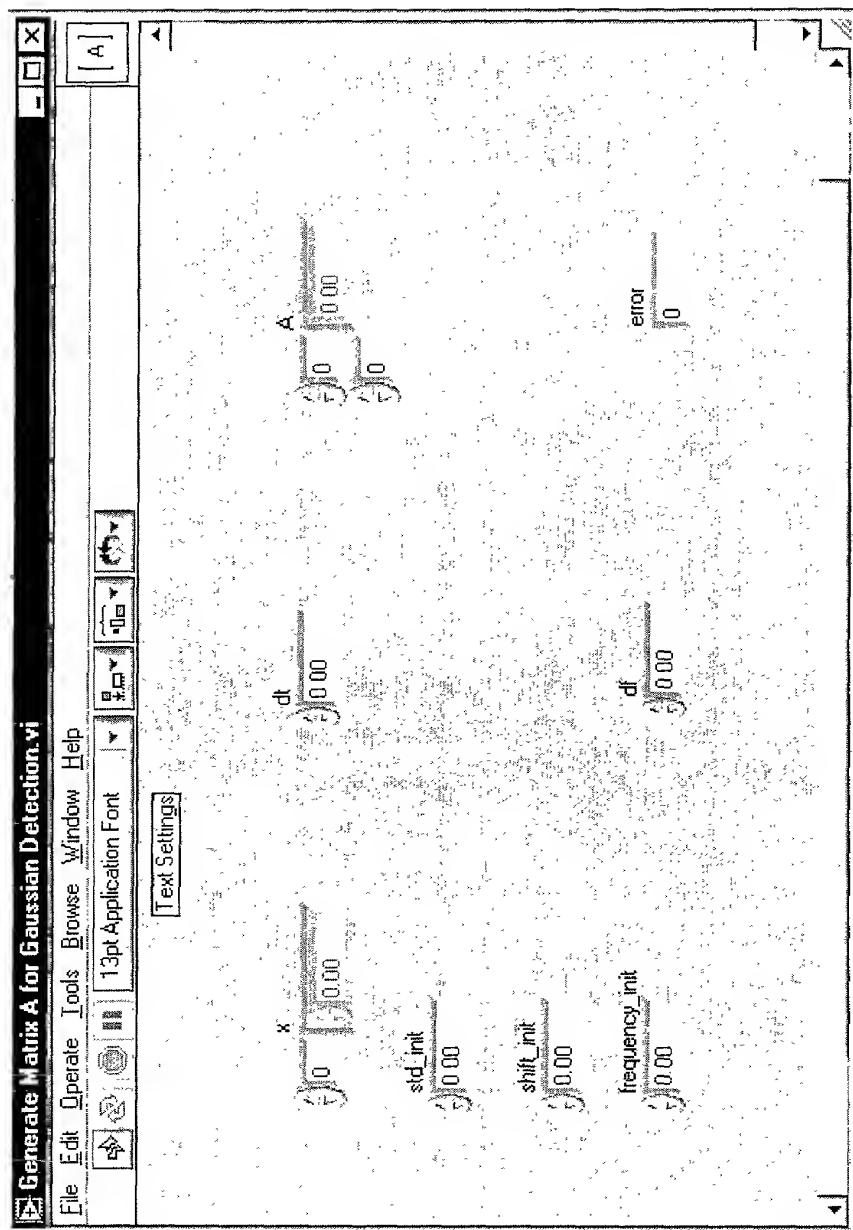
Figure 24A

Figure 24B

Figure 25A

Figure 25B

Figure 26A

Figure 26B

Figure 27A

Figure 27B

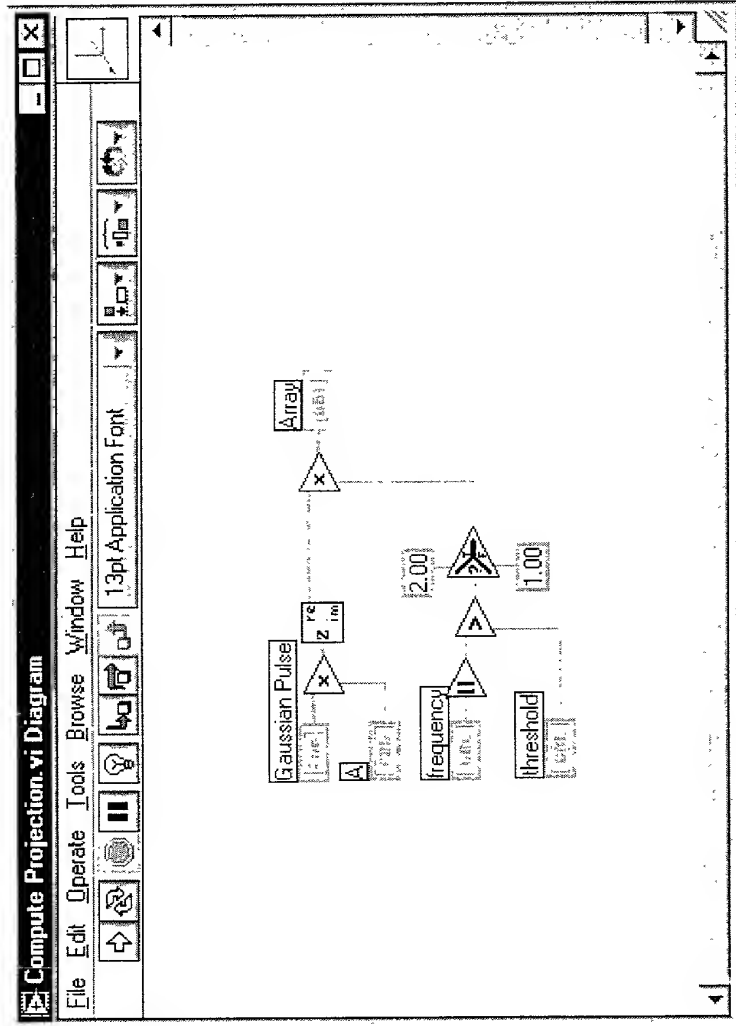Figure 28A
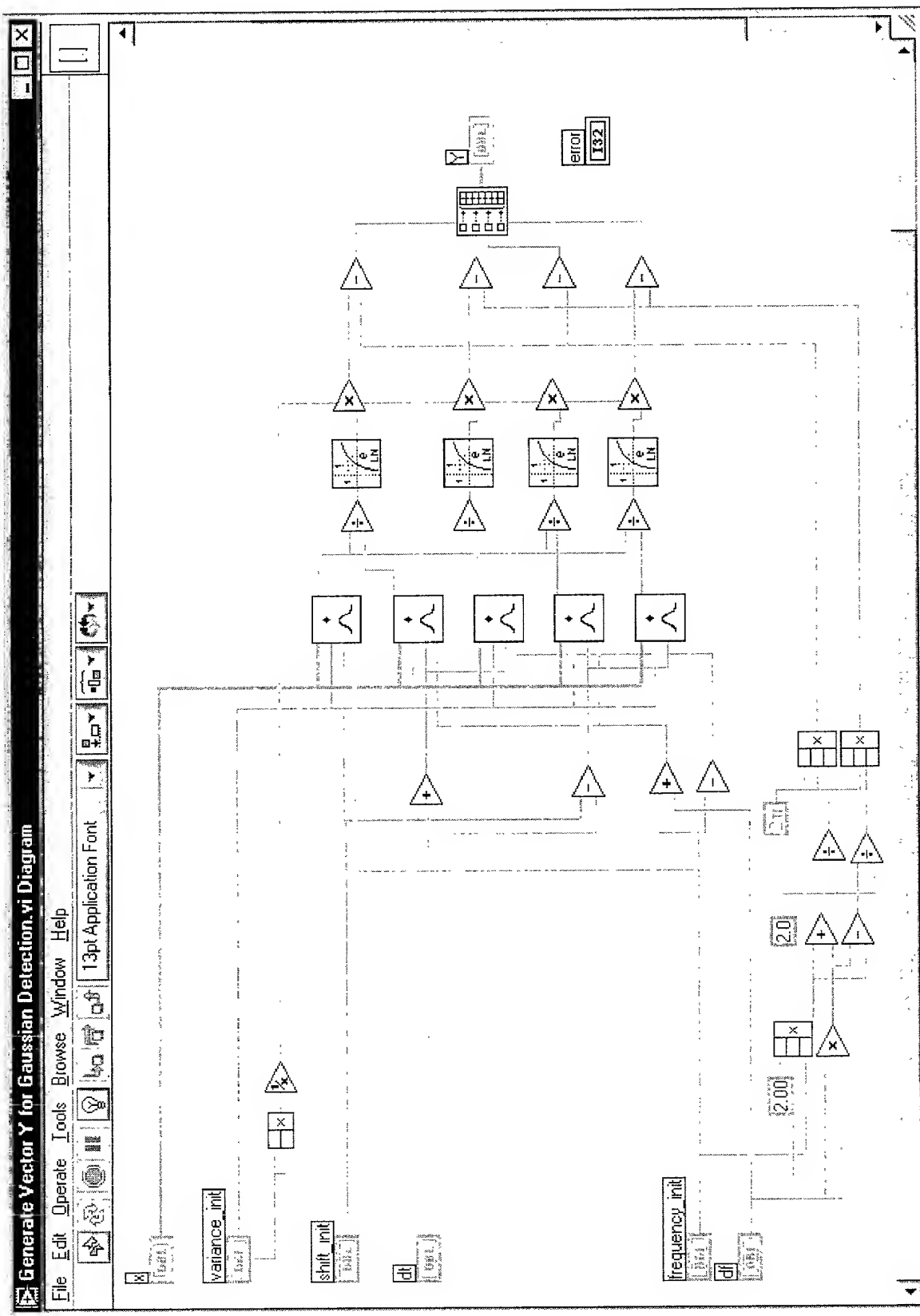
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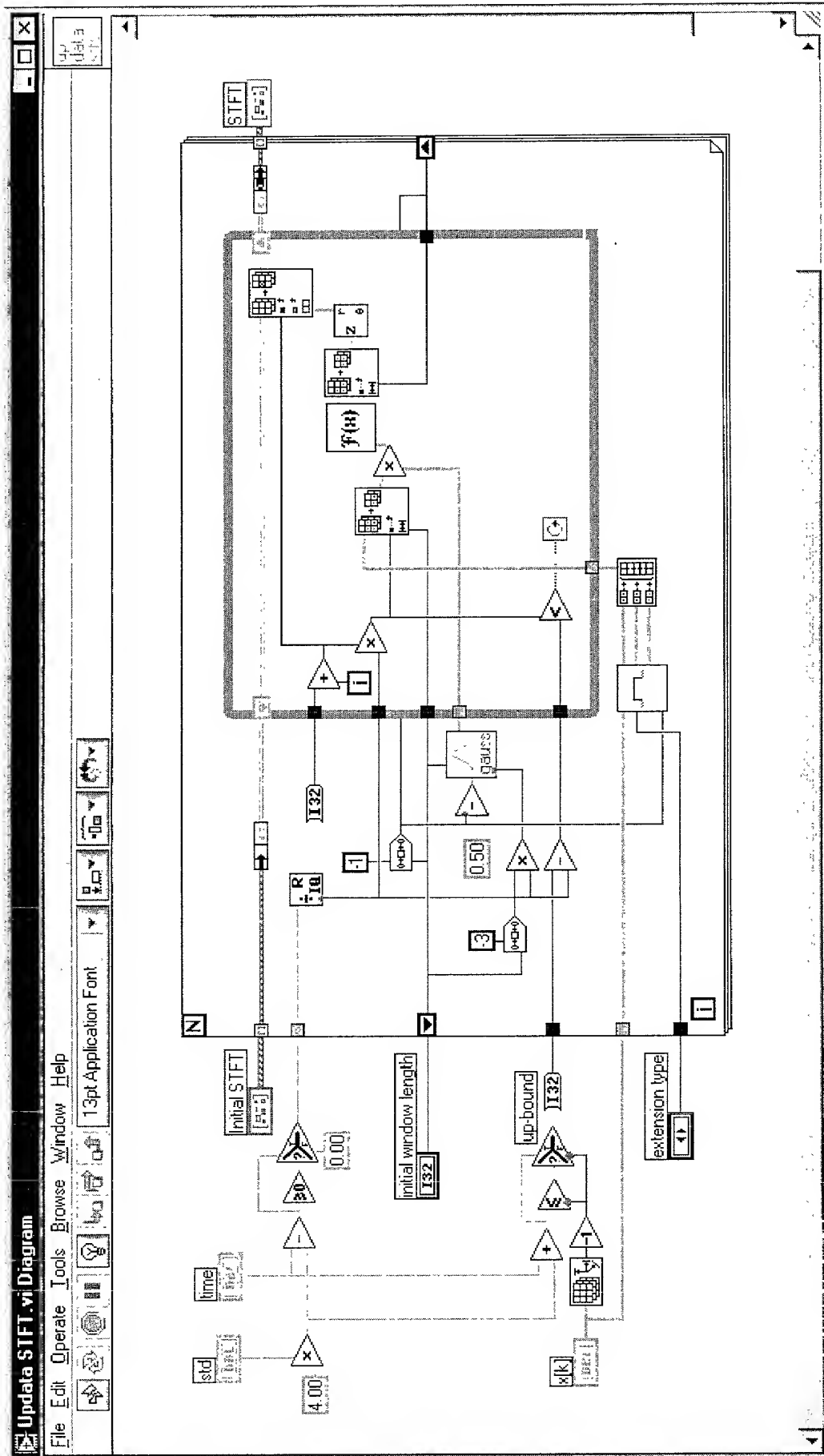
Figure 29A

Figure 29B
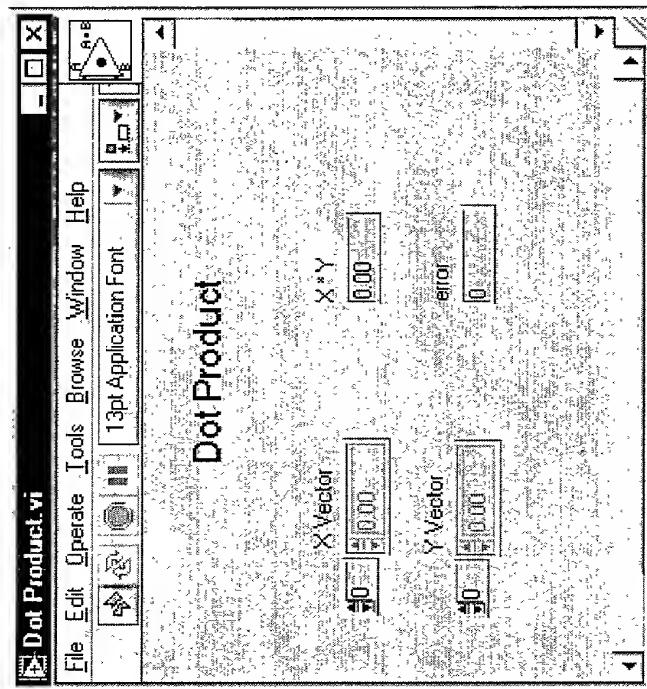
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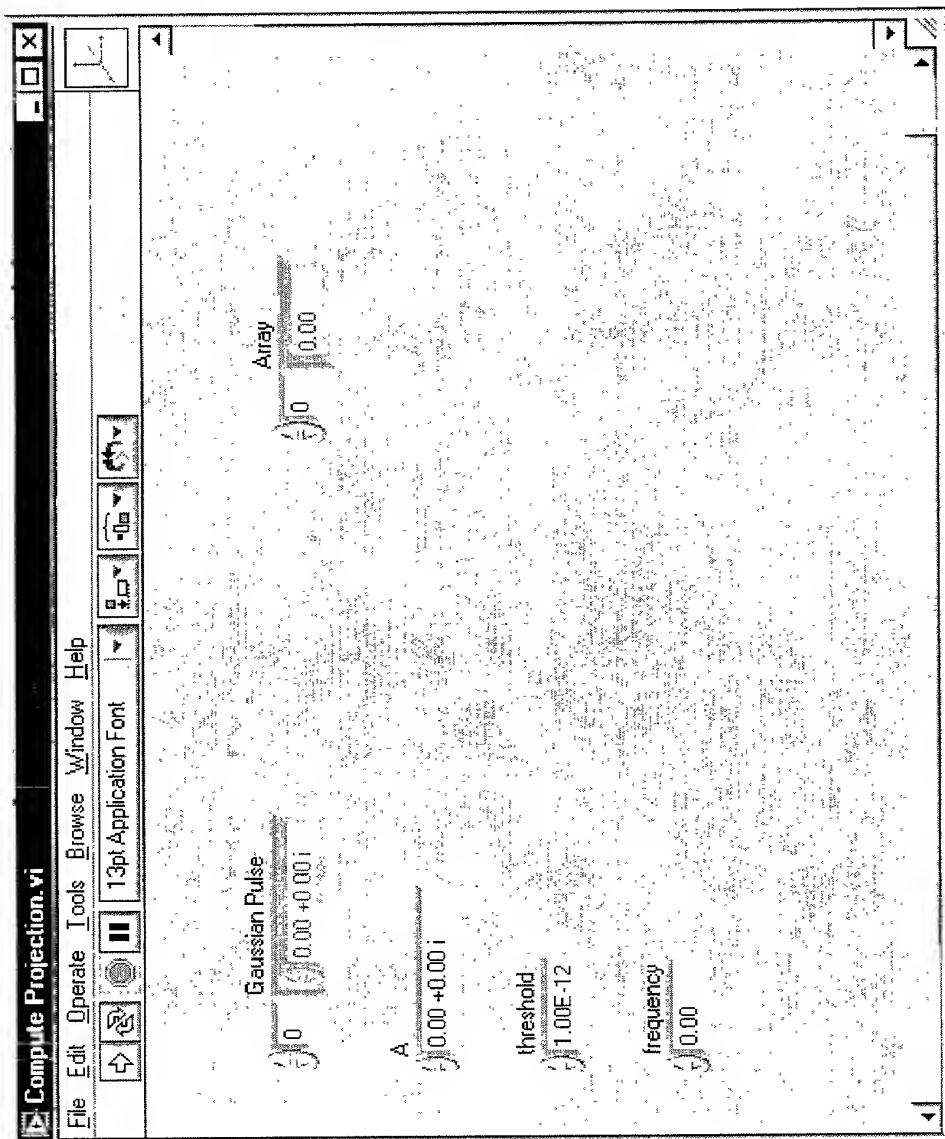
Figure 30B

Figure 31A

Figure 31B

Figure 32

Figure 33